DOCUMENT RESUME

ED 126 289 CE 007 309

TITLE	Occupational Outlook Handbook, 1976-77 Edition.
INSTITUTION	Bureau of Labor Statistics (DOL), Washington, D.C.
REPORT NO	Bull-1875
PUB DATE	76
NOTE	793p.; Photographs will reproduce poorly
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Stock Number 029-001-01406-6, $7.00)
EDRS PRICE	MF-$1.50 HC-$42.19 Plus Postage.
DESCRIPTORS	Employment Opportunities; *Employment Projections; *Employment Qualifications; *Employment Trends; *Guides; Job Skills; Occupational Clusters; *Occupational Guidance; *Occupational Information; Occupations; Reference Books; Wages; Work Environment

ABSTRACT

The first part of the handbook contains revised guidelines for its use, suggestions on where to go for more information, a discussion of assumptions and methods used in preparing employment projections, and a look into the future. More than 850 occupational briefs are presented, grouped into 13 occupational clusters and 35 industry briefs. The 13 clusters are: industrial production and related occupations; office occupations; service occupations; education and related occupations; sales occupations; construction occupations; occupations in transportation activities; scientific and technical occupations; mechanics and repairers; health occupations; social scientists; social service occupations; and art, design, and communications-related occupations. For each occupation information is presented on the nature of the work; places of employment training, other qualifications, and advancement; employment outlook; earnings and working conditions; and sources of additional information. The employment outlook for the following industries: agriculture; mining and petroleum; construction; manufacturing; transportation, communications, and public utilities; wholesale and retail trade; finance, insurance, and real estate; service and miscellaneous industries; and government are presented. Access to the occupational brief is made possible by way of a Dictionary of Occupational Titles index and alphabetical index. (EC)

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ED126289

Occupational Outlook Handbook, 1976-77 Edition

U.S. Department of Labor
W. J. Usery, Jr., Secretary

Bureau of Labor Statistics
Julius Shiskin, Commissioner

1976

Bulletin 1875

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NATIONAL INSTITUTE OF EDUCATION

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POINTERS ON USING THE HANDBOOK

To learn about this Handbook, see How to Use the Handbook, page 3.

To locate an occupation or industry, see:
Table of Contents, page ix.
Dictionary of Occupational Titles Index, page 745.
Alphabetical Index, page 756.

Job titles which connote sex stereotypes have been changed.
A number of job titles have been revised in this edition of the Handbook in order to eliminate connotations of sex stereotyping. The new titles are consistent with changes in the occupational classification system used by the U.S. Bureau of the Census, and with considerably more numerous changes in the Dictionary of Occupational Titles.

For a general view of work and jobs in the United States, read the chapter on Tomorrow's Jobs, page 13.

Forecasts of the future are precarious! Keep in mind the explanation on page 5 of what the employment outlook information in the Handbook really means. Read the section on Assumptions and Methods Used in Preparing the Employment Projections, page 11.

The job picture is constantly changing. To find out how you can keep your information up to date, see the section on Where to Go for More Information, page 9.

You may need local information, too. The Handbook gives facts about each occupation for the United States as a whole. See page 9 for sources of job information in your hometown.

Reprints from the *Handbook* provide an inexpensive way to get occupational outlook information about particular fields. For instructions on how to order one or more of 155 reprints, see page 776.

SUBSCRIBE TO THE OCCUPATIONAL OUTLOOK QUARTERLY, AN ESSENTIAL COMPANION TO YOUR HANDBOOK

It keeps you up to date on fast-changing employment trends.

It reports promptly on new occupational research results

It analyzes legislative, educational, and training developments that affect career planning

Foreword

The difficulties young people experience when making the transition from school to work has been recognized by leaders in government and education as a serious national problem. One way to help ease this transition is to provide young people with accurate and comprehensive career guidance information. By acquiring specific knowledge of the various occupations in our economy, they can become aware of the opportunities and alternatives that are available to them, and can plan for careers suited to their abilities and aspirations.

The *Occupational Outlook Handbook* is a major source of vocational guidance information for hundreds of occupations. For each occupation, the *Handbook* describes what workers do on the job, the training or education needed, and most importantly, some idea of the availability of jobs in the years ahead.

Although its main purpose is providing information to young people, the *Handbook* is also a useful resource for persons entering or reentering the work force at later stages in their lives. Our hope in the Department of Labor is that this publication will continue to offer valuable assistance to all persons seeking satisfying and productive employment.

W. J. Usery, Jr., Secretary of Labor

Prefatory Note

In our constantly changing economy, information on future career opportunities and educational requirements is necessary if young people are to be prepared for tomorrow's jobs. For more than 30 years, the Bureau of Labor Statistics has conducted research on occupations and industries for the purpose of providing this information for use in vocational guidance.

The major product of this research is the *Occupational Outlook Handbook*, which contains information on job duties, educational requirements, employment outlook, and earnings for more than 850 occupations and 30 industries. The *Handbook* information is based on data received from a variety of sources, including business firms, trade associations, labor unions, professional societies, educational institutions, and government agencies, and represents the most current and comprehensive information available.

As part of the Bureau's continuing effort to increase the usefulness of the *Handbook*, the new edition has been substantially revised. The format has been simplified, and a number of statements include information on the effect of fluctuations in the business cycle as well as long-run expectations. The new *Handbook* uses the revised non-sexist job titles developed for the *Dictionary of Occupational Titles*, and includes expanded information on high school courses that are useful in preparing for each occupation. Finally, this edition contains new guides on using the *Handbook* for both students and counselors.

Julius Shiskin, Commissioner, Bureau of Labor Statistics

Letter of Endorsement

Work can be one of life's most rewarding experiences. A job can offer pride in achievement and an opportunity for personal growth, as well as the security of an adequate income. But finding work that is satisfying seldom is easy. Career planning with the advice of trained counselors can help a great deal.

To assist individuals with their educational and vocational choices, counselors must have occupational information that is current, accurate, and comprehensive. The *Occupational Outlook Handbook* is a primary source of the information needed for sound career planning. For more than 850 occupations and 30 major industries, the *Handbook* describes what workers do on the job, the training and education required, advancement possibilities, employment outlook, and earnings and working conditions. Most statements also list professional societies, trade associations, unions, and other organizations that can supply additional career information.

Counselors in all work settings will find the new edition of the *Occupational Outlook Handbook* an invaluable tool for helping clients plan a satisfying future in the working world.

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Contributors

The *Handbook* was prepared in the Bureau of Labor Statistics, Division of Occupational Outlook, under the supervision of Russell B. Flanders and Neal H. Rosenthal. General direction was provided by Dudley E. Young, Assistant Commissioner for Employment Structure and Trends.

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The Bureau of Labor Statistics gratefully acknowledges the coope ation and assistance of the many government and private sources that either contributed photographs or made their facilities available to the U.S. Department of Labor photographers for this edition of the *Occupational Outlook Handbook*.

Government Sources

Federal. Department of Agriculture; Department of the Air Force; Department of the Army; Department of Health, Education, and Welfare; Department of Interior; Department of Jus e; Department of Labor; Department of Transportation; ERDA; Forest Service; General Services Administration; Government Printing Office; National Aeronautics and Space Administration; National Oceanographic and Atmospheric Administration; National Institutes of Health; Department of the Navy; U.S. Postal Service; and Smithsonian Institution.

State and Local. City of Cincinnati, City of Denver; District of Columbia; City of Houston; Ohio—State Police; and Prince Georges County (Maryland).

Private Sources

Membership Groups. Aluminum Association; American Bankers Association; American Chemical Society; American Chiropractors Association; American Dental Assistants Association; American Dentists Association; American Home Economic Association; American Hotel and Motel Association; American Institute of Architects; American Iron and Steel Institute; American Optometric Association; American Podiatry Association; American Society of Planning Officials; American Trucking Association; Associated General Contractors of America; Association of America Railroads; Aviation Maintenance Foundation; Forging Industries Association; Gypsum Drywall Contractors International; International Alliance of Theatrical Stage Employers and Moving Picture Machine Operators of the United States and Canada; International Brotherhood of Electrical Workers; International Ladies' Garment Workers Union; International Taxicab Association; Marble Institute of America; Motor Vehicle Manufacturer's Association; National Association of Auto Dealers; National Pest Control Association; National Committee on Household Developments; National Education Association; Public Relations Society of America, Inc.; Society of American Florists and Ornamental Horti culturists; and United Auto Workers.

Industry and Business. Aerospace Corp.; Air Reduction Co., Inc.; American Telephone and Telegraph; ARA Services; Bausch and Lomb; Brunswick Corp.; Canteen Corp.; Chase Manhattan Bank; The C&O/B&O Railroads; Chesapeake and Potomac Telephone Co.; Chrysler Corp.; Clairol; Clark Equipment Corp.; Conrad Hilton Hotels; Consolidated Edison Company of New York; Continental Trailways Co.; Delta Airlines; Doggett Enterprises; Dow Chemical Corp.; Drexel Furniture Co.; Eastman Kodak Co.; Eli Lilly Corp.; Ford Motor Co.; General Dynamics Corp.; General Electric Corp.; General Foods Corp.; Georgia-Pacific Co.; Gilpin Wholesale Druggist Co.; Girard Bank and Trust Co.; Goodyear Tire and Rubber Co.; GEICO; Grand Union Stores; Grumman Aerospace Corp.; Gulf Oil Corp.; Harley-Davidson Motorcycles; Harshe-Rotman, and Drucke, Inc.; Irving Cloud Publishing Co.; Inland Steel Co.; Louisiana-Pacific Corp.; Marine Midland; Marriott; Merkle Press; Mutual of Omaha; National Cash Register Co.; Neiman Marcus; Oster Corp.; Phillips Petroleum Co.; PPG Industries; Price Waterhouse; RCA; Santa Fe Railroad; Schlage Locke Co.; Sears Roebuck Co.; Snelling and Snelling, Southern Railroad System; Stacy Adams; Steelcase; Sun Oil Co.; Texaco; Texas Instruments; Thompson and Litton, Inc.; Unilux, Inc.; Union Carbide; Weyerhauser Co.; Winchester—Western; and Woodward and Lothrop.

Publications. *The Catholic Standard; Contractor* magazine; *Farm and Power Magazine; Jeweler's Topics; Jobber Topics; New York Daily News; Snips Magazine; Washington Star Newspaper; and Women's Wear Daily*.

Schools. Cape Fear Technical Institutes; George Washington University; Johns Hopkins University; Na-

tional Radio Astronomy Observatory; University of Delaware; and University of Maryland.

Other. Children's Hospital of Chicago; Children's Hospital of the District of Columbia; Fletcher Drake; Holy Cross Hospital; Lutheran Theological Seminary; Metropolitan Opera; Mobile General Hospital; National Ballet; United Nations; and WRC-TV (Washington, D.C.).

Note

A great many trade associations, professional societies, unions, and industrial organizations are able to provide career information that is valuable to counselors and job seekers. For the convenience of *Handbook* users, some of these organizations are listed at the end of the statements on individual occupations and industries. Although these references were assembled carefully, the BLS has neither authority nor facilities for investigating the organizations listed. Also, because the Bureau does not preview all the information or publications that may be sent in response to a request, it cannot guarantee the accuracy of such information. *The listing of an organization, therefore, does not constitute in any way an endorsement or recommendation by the Bureau or the U.S. Department of Labor, either of the organization and its activities or of the information it may supply*. Each organization has sole responsibility for whatever information it may issue.

The occupational information contained in the *Handbook* presents a general, composite description of jobs and industries and cannot be expected to reflect work situations in specific establishments or localities. *The Handbook, therefore, is not intended and should not be used as a guide for determining wages, hours, the right of a particular union to represent workers, appropriate bargaining units, or formal job evaluation systems.*

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GUIDE TO THE HANDBOOK

WHAT'S IN THE HANDBOOK?

- Introductory sections which tell how to use the Handbook, where to go for more career information, how employment projections are made, and where tomorrow's jobs will be.
- 300 occupational briefs, grouped into 13 clusters of related jobs
- 35 industry briefs
- Index of job titles by Dictionary of Occupational Titles code
- Instructions for ordering Handbook reprints, the Occupational Outlook Quarterly, and other BLS publications which will keep you informed about the economy and the job market.

HOW TO USE THE HANDBOOK

How many kinds of jobs are there?

More than 850 occupations are described in the *Handbook*. Although this is a large number, the total number of occupations in the U.S. economy may be counted in the thousands. Jobs in the *Handbook* generally are those which young people are most interested in learning about. Most occupations requiring long periods of education or training are discussed, as are a number of small but growing fields of employment. Altogether, the occupations in the *Handbook* account for about 95 percent of all salesworkers; about 90 percent of professional, craft, and service workers; 80 percent of clerical workers; 50 percent of all operatives; and smaller proportions of managerial workers and laborers. The main types of farming occupations are described in the *Handbook*. The long-term job outlook for the Nation as a whole is discussed, too.

Where should I look first?

Start with jobs you know something about or are interested in. If an important industry is located in your hometown, for example, you may find it useful to read the *Handbook* industry statement to find out about the many different kinds of jobs in that industry and their differing training requirements and earnings potential. There are 35 industry statements in the *Handbook*, grouped according to major divisions in the economy: Agriculture, mining, and petroleum; construction; manufacturing; transportation, communications, and public utilities; wholesale and retail trade; finance, insurance, and real estate; services; and government. You may wish to talk with your parents or your counselor about current job prospects in your own area.

You may be interested in a certain field—sales work or repair work, for example. To find out what kinds of jobs there are in that field, consult the *Handbook's* Table of Contents for the appropriate career "cluster." All of the occupational briefs in the *Handbook* are arranged in "clusters" of related jobs. There are 15 clusters altogether: Industrial production, office, service, education, sales, construction, transportation, scientific and technical, mechanics and repair, health, social science, social service, and art, design, and communications occupations. Most career clusters in the *Handbook* describe a variety of jobs in a single field. Training and skill requirements within a particular cluster often vary a great deal. If you are thinking about a future in the health field, for example, you will find that a few jobs in this field require only a high school diploma; others require a degree from a 2-year community college or junior college; still others require a bachelor's degree; and a few require 4 years or more of formal training following college graduation.

You may already have a specific job in mind. To find out where it is described, turn to the Index of Occupations and Industries at the back of the book.

What will I learn?

Once you have chosen a place to begin—an occupation or industry you'd like to learn more about—you can use the *Handbook* to find out what the job is like, what education and training is necessary, and what the advancement possibilities, earnings, and employment outlook are likely to be. Each section of the *Handbook* follows a standard format, making it easier to compare different jobs with one another.

It is important to bear in mind that the information in the *Handbook* is designed for career guidance purposes. In the effort to present a meaningful overview of each of several hundred jobs, details are omitted, and some distinctions are glossed over. Moreover, each statement has its own limitations, mostly because of imperfect data sources and limits on length. What follows is a description of the type of information presented in each *Handbook* statement, with a few words of explanation.

The numbers in parentheses which appear just below the title of most *Handbook* statements are *D.O.T. code numbers*. D.O.T. stands for *Dictionary of Occupational Titles*, now in its third edition, a U.S. Department of Labor publication which "defines" each of about 35,000 jobs according to a system which uses code numbers to classify each job in terms of the type of work performed, training required, physical demands, and working conditions. Revision of the D.O.T. is underway, and the fourth edition is scheduled to appear in 1976. It will include thousands of new jobs which have emerged as a result of technological and other changes in the past 10 years. An index listing

Handbook occupations by D.O.T. number precedes the alphabetical Index of Industries and Occupations. D.O.T. numbers are used primarily by public employment service agencies for classifying applicants and job openings, and for reporting and other operating purposes. They are included in the *Handbook* since career information centers and libraries frequently use them for filing occupational information.

The **Nature of the Work** section describes the major duties of workers in the occupation. It tells what workers do on the job and how they do it. Although each job description is typical of the occupation, duties are likely to vary by employer and size of employing organization, geographic location, and other factors. In some occupations, individual workers specialize in certain tasks. In others they perform the entire range of work in the occupation. Of course, job duties continually change as technology advances, new industrial processes are developed, and products or services change. In preparing the *Handbook*, every effort is made to include the most recent information available, but because of the rapid rate of change in some fields, this is not always possible.

The **Places of Employment** section provides information on the number of workers in an occupation and tells whether they are concentrated in certain industries or geographic areas. Whether an occupation is large or small is important to a jobseeker because large occupations, even those growing slowly, offer more openings than small ones because of the many workers who retire or die each year.

Some occupations are concentrated in particular industries. Most cooks and chefs, for example, are employed in restaurants and hotels while secretaries are employed in almost every industry. If an occupation is found primarily in certain industries, this section lists them.

A few occupations are concentrated in certain parts of the country. Actors and actresses, for example, usually work in California and New York. This information is included for the benefit of people who have strong preferences about where they live—because they do not wish to be separated from their families and friends, for example. For most occupations, however, employment is widely scattered and generally follows the same pattern as the distribution of the population.

In addition, the proportion of women employed is mentioned in a number of *Handbook* statements. Information on part-time employment is included because it is important to students, homemakers, retired persons, and others who may want to work part time. Knowing which occupations offer good opportunities for part-time work can be a valuable lead.

The **Training, Other Qualifications, and Advancement** section should be read carefully because it often is necessary to start planning toward your career goal early in high school. It's a good idea to look closely at the list of high school and college courses regarded as useful preparation for the career you have in mind. Nearly all *Handbook* statements list such courses.

Workers can qualify for jobs in a variety of ways, including college study leading to a certificate or associate degree; programs offered by post-secondary vocational schools, both public and private; home study courses; government training programs; experience or training obtained in the Armed Forces; apprenticeship and other formal training offered on-the-job or in the classroom by employers; and high school courses. For each occupation, the *Handbook* identifies which of these routes of entry is preferred. In many cases, alternative ways of attaining training are listed as well. It is worth remembering that the level at which you enter an occupation and the speed with which you advance often are determined by the amount of training you have.

In an effort to protect the public, all States have certification or licensing requirements for some occupations to assure that workers are properly qualified. Physicians and nurses, elementary and secondary schoolteachers, barbers and cosmetologists, electricians and plumbers are examples of occupations that are licensed. If you are considering occupations that require State licensing, be sure to check the requirements in the State in which you plan to work.

An important factor in career choice is the extent to which a particular job suits your personality. Although it is often difficult for people to assess themselves, your counselor undoubtedly is familiar with tests that can help. Each statement in the *Handbook* provides information which allows you to match your own unique personal characteristics—your likes and dislikes—with the characteristics of the job. For a particular job, you may need the ability to:

make responsible decisions.

motivate others.

direct and supervise others.

work under close supervision.

work in a highly competitive atmosphere.

enjoy working with ideas and solving problems.

enjoy working with people.

enjoy working with things—good coordination and manual dexterity are necessary.

work independently—initiative and self-discipline are necessary.

work as part of a team.

enjoy working with detail, either numbers or technical written material.

enjoy helping people.

use creative talents and ideas and enjoy having an opportunity for self-expression.

derive satisfaction from seeing the physical results of your work.

work in a confined area.

perform repetitious work.

enjoy working outside, regardless of the weather.

The **Employment Outlook** section discusses prospective job opportunities. Knowing whether or not the job market is likely to be favorable is quite important in deciding whether to pursue a specific career. While your interests, your abilities, and your career goals are extremely important, you also need to know something about the availability of jobs in the fields that interest you most.

The employment outlook section of most *Handbook* statements begins with a sentence about anticipated employment growth through 1985. The occupation is described as likely to grow about as fast as the average for all occupations; faster than the average; or slower than the average (Figure I). *Job opportunities in a particular occupation usually are favorable if employment increases at least as rapidly as the economy as a whole. Occupations in which employment stays about the same or declines generally offer less favorable job prospects than growing occupations, because the only openings are those due to turnover.*

Some *Handbook* statements take note of the effect of fluctuations in the business cycle. This information is valuable to people looking into long-range career possibilities at a time when the economy is in a recession. Young people understandably wonder: What will the economy be like when I enter the labor market? Will it be harder to find a job 5 or 10 years from now than it is today? The *Handbook* gives information, wherever feasible, on occupations and industries whose levels of employment fluctuates in response to shifts in the economic climate. It helps to bear in mind that employment in many—but not all—occupations and industries is directly affected by an economic downturn. A sharp improvement in the outlook for these occupations and industries is likely as the economy picks up. However, other occupations and industries are less vulnerable to changes in the business cycle. Other factors influence their well-being. These matters are explored in a number of *Handbook* statements.

Figure I

Description	*Projected 1974–85 change in employment requirements*
Much faster than the average for all occupations	50.0 percent or greater
Faster than the average for all occupations	25.0 to 49.9 percent
About as fast as the average for all occupations[1]	15.0 to 24.9 percent
Slower than the average for all occupations	4.0 to 14.9 percent
Little change is expected	3.9 to −3.9 percent
Expected to decline	−4.0 percent or greater

[1] The average increase projected for all occupations for the 1974–85 period is 20.3 percent.

For some occupations, it is possible to observe trends in the number of people pursuing relevant types of education or training and subsequently entering the profession. When supply as well as demand information is available, the *Handbook* describes prospective job opportunities in terms of the anticipated demand-supply relationship. The prospective job situation is termed "excellent" when demand is likely to greatly exceed supply; "keenly competitive" when supply is likely to exceed demand. Other terms used in *Handbook* statements are shown in Figure II.

The information in this section should be used carefully, however. The prospect of relatively few openings, or of strong competition, in a field that interests you should make you take a second look at your career choice. But this information alone should not prevent you from pursuing a particular career if you feel that your aptitudes and interests justify your goal. Getting a job may be difficult if the field is so small that openings are few (actuaries and blacksmiths are examples) or so popular that it attracts many more jobseekers than there are jobs (radio and television broadcasting, journalism, the performing arts, and modeling). Getting a job also can be difficult in occupations and industries in which employment is declining (merchant sailors, photoengravers, typesetters), although this is not always the case.

Remember, even occupations which are small or overcrowded provide some jobs. So do occupations in which employment is growing very slowly or even declining, for there always is a need to replace workers who leave the occupation. If the occupation is large, the number of job openings due to turnover can be quite substantial. Bookkeepers, telephone operators, and machinists are examples of large occupations which provide a significant number of job openings each year because of turnover. On the average, openings resulting from replacement needs are expected to account for 70 percent of all job openings.

In other words, *don't* rule out a

Figure II

Job opportunities	*Prospective demand-supply relationship*
Excellent	Demand much greater than supply
Very good	Demand greater than supply
Good or favorable	Rough balance between demand and supply
May face competition	Likelihood of more supply than demand
Keen competition	Supply greater than demand

potentially rewarding career simply because the prospective outlook in an occupation is not favorable. *Do* discuss your abilities and aptitudes with your counselor. Checking further is a good idea, too. Suggestions for additional information on the job market are given in the following section, Where to Go for More Information.

How reliable is the information on the outlook for employment over the next 10 years? No one can predict future labor market conditions with perfect accuracy. In every occupation and industry, the number of jobseekers and the number of job openings constantly changes. A rise or fall in the demand for a product or service affects the number of workers needed to produce it. New inventions and technological innovations create some jobs and eliminate others. Changes in the size or age distribution of the population, work attitudes, training opportunities, or retirement programs determine the number of workers available. As these forces interact in the labor market, some occupations experience a shortage, some a surplus, some a balance between jobseekers and openings. Methods used by economists to develop information on future occupational prospects differ, and judgments which go into any assessment of the future also differ. Therefore, it is important to understand what underlies each statement on outlook.

For every occupation and industry covered in the *Handbook*, an estimate of future employment needs is developed. These estimates are consistent with a set of assumptions about the future of the economy and the country. For more detail, see the section entitled, Assumptions and Methods Used In Preparing the Employment Projections.

Finally, you should remember that job prospects in your community or State may not correspond to the description of employment outlook in the *Handbook*. For the particular job you are interested in, the outlook in your area may be better, or worse. The *Handbook* does not discuss the outlook in local areas because the analysis is far too much for a centralized staff to handle. Such information has been developed, however, by many States and localities. The local office of your State Employment Service is the best place to ask about local-area employment projections. Be sure to check with your parents and counselors, too.

The **Earnings** section helps answer many of the questions that you may ask when choosing a career. Will the income be high enough to maintain the standard of living I want and justify my training costs? How much will my earnings increase as I gain experience? Do some areas of the country or some industries offer better pay than others for the same type of work?

Like most people, you probably think of earnings as money. But money is only one type of financial reward for work. Paid vacations, health insurance, uniforms, and discounts on clothing or other merchandise also are part of the total earnings package.

About 9 out of 10 workers receive money income in the form of a *wage or salary*. A wage usually is an hourly or daily rate of pay, while a salary is a weekly, monthly, or yearly rate. Most craft workers, operatives, and laborers are wage earners, while most professional, technical, and clerical workers are salary earners.

In addition to their regular pay, wage and salary workers may receive extra money for working overtime, more than their usual number of hours, or on a night shift or irregular schedule. In some occupations, workers also may receive tips or be paid a commission based on the amount of sales or services they provide to customers. Factory workers are sometimes paid a piece rate which is an extra payment for each item they produce. For many workers, these types of pay amount to a large part of their total earnings.

The remaining 10 percent of all workers are in business for themselves and earn *self-employment income* instead of wages or salaries. This group includes workers in a wide variety of occupations: Physicians, shopkeepers, barbers, writers, photographers, and farmers are examples of workers who frequently are self-employed.

Workers in some occupations earn self-employment income in addition to their wages or salaries. For example, electricians and carpenters often do small repair or remodeling jobs during evenings or weekends, and college professors frequently are paid for publishing articles based on independent research.

Besides money income, most wage and salary workers receive a variety of *fringe benefits* as part of their earnings on the job. Several are required by Federal and State law, including Social Security, Worker's Compensation, and Unemployment Insurance. These benefits provide income to persons who are not working because of old age, work-related injury or disability, or lack of suitable jobs.

Among the most common fringe benefits are paid vacations, holidays, and sick leave. In addition, many workers are covered by life, health, and accident insurance; participate in retirement plans; and are entitled to supplemental unemployment benefits. All of these benefits are provided—in part or in full—through their employers. Some employers also offer stock options and profit-sharing plans, savings plans, and bonuses.

Workers in many occupations receive part of their earnings in the form of goods and services, or *payments in kind*. Sales workers in department stores, for example, often receive discounts on merchandise. Workers in other jobs may receive

free meals, housing, business expense accounts, or free transportation on company-owned planes.

Which jobs pay the most? This is a difficult question to answer because good information is available for only one type of earnings—wages and salaries—and for some occupations even this is unavailable. Nevertheless, the *Handbook* does include some comparisons of earnings among occupations. Most statements indicate whether earnings in an occupation are greater than or less than the average earnings of workers who are not supervisors and work in private industry, but not in farming. This group represented more than 80 percent of all workers in 1974 and had the most reliable earnings data currently available for comparison purposes.

Comparisons also are made among earnings for similar occupations. For example, hourly earnings of construction occupations can be compared to determine whether bricklayers earn more than carpenters, or electricians more than plumbers.

Besides differences among occupations, many levels of pay exist within each occupation. Beginning workers almost always earn less than those who have been on the job for some time because pay rates increase as workers gain experience or do more responsible work.

Earnings in an occupation also vary by geographic location. The average weekly earnings of beginning computer programmers, for example, vary considerably from city to city. (See table 1.) The highest earnings of the 10 cities listed, occurred in Detroit, Mich. and the lowest in Little Rock, Ark. Although it is generally true that earnings are higher in the North Central and Northeast regions than in the West and South, there are exceptions. You should also remember that those cities which offer the highest earnings are often those in which it is most expensive to live.

In addition, workers in the same occupation may have different earnings depending on the industry in which they work. For example, senior accounting clerks in 1973-74 averaged $183 a week in public utilities, $163.50 a week in manufacturing, $156 a week in wholesale trade, and $149.50 a week in services, but only $137.50 in retail ail trade and $138.50 in finance, insurance, and real estate.

Table 1. Average weekly earnings of beginning computer programmers, 1973–74, by selected city

City	Average weekly earnings
Detroit	$212.00
Atlanta	202.50
Cleveland	198.00
Newark	190.00
Seattle	184.00
Washington, D.C.	179.00
Omaha	169.50
Milwaukee	164.50
Chattanooga	147.00
Little Rock	129.50

SOURCE: Bureau of Labor Statistics.

Table 2. Average annual salaries of chemists, with Ph.D. degrees, by type of work, 1974

Type of work	Annual salaries
Management	$27,000
Marketing and production	23,000
Research and development	21,500
Teaching	16,800
Other	20,300

SOURCE: American Chemical Society.

Salaries also vary by the type of work a person performs. The salaries of Ph. D. chemists, for example, vary considerably depending on the specific nature of the job, as shown in table 2. In 1974, chemists in management jobs earned $4,000 a year more than those in marketing and production. Chemists in research and development, however, earned $1,500 less than those in marketing and production, but $4,700 more than chemistry professors.

Because of these variations in earnings, you should check with your counselor or with local employers if you are interested in specific earnings information for occupations in your area.

The **Working Conditions** section provides information that can affect job satisfaction because preferences for working conditions vary considerably among individuals. Some people, for example, prefer outdoor work while others prefer working in an office. Some people like the variety of shift work, and others want the steadiness of a 9-to-5 job. Following is a list of several different types of working conditions that apply to some of the occupations in the *Handbook*.

Overtime work. When overtime is required on a job, employees must give up some of their free time and need to be flexible in their personal lives. Overtime, however, does provide the opportunity to increase earning power.

Shift work. Evening or night work is part of the regular work schedule in

some jobs. Employees who work on these shifts usually are working while most other people are off. Some persons prefer shift work, however, because they can pursue certain daytime activities, such as hunting, fishing, or gardening.

Environment. Work settings vary from clean, air-conditioned offices to places that are dirty, greasy, or poorly ventilated. By knowing the setting of jobs you find interesting, you can avoid an environment that you may find particularly unpleasant.

Outdoor work. Persons who work outdoors are exposed to all types of weather. This may be preferred to indoor work, however, by those who consider outdoor work more healthful.

Hazards. In some jobs employees are subject to possible burns, cuts, falls, and other injuries and must be careful to follow safety precautions.

Physical demands. Some jobs require standing, stooping, or heavy lifting. You should be sure that you have the physical strength and stamina required before seeking one of these jobs.

Considering working conditions when you make up your mind about a career can help you choose a job that brings you satisfaction and enjoyment.

WHERE TO GO FOR MORE INFORMATION

By now, you may have some ideas about jobs that interest you and that seem to suit you. If so, you probably have located appropriate *Handbook* statements and given some thought to the information they contain—either on your own or with the help of your counselor. If you want more information on the job itself, on places in your own locality to look for this kind of work or on schools which offer appropriate training—or, if instead, you simply want to explore the file a little more—you're ready to go beyond the *Handbook*.

A great deal of career information is available in the form of books, pamphlets and brochures, magazine articles, filmstrips, tapes, and cassettes. Computer-assisted occupational information systems have been installed in some schools and career information centers.

Most occupational reports in the *Handbook* suggest organizations you can write to for additional career information. This is a good way to begin. Then investigate other sources of information, many of which you'll find close to home: schools, libraries, business establishments, trade unions, employer associations, professional societies, private employment agencies, and State Employment Services.

School libraries and guidance offices usually have extensive collections of career information. In addition, counselors and teachers generally know of any special information assembled on job opportunities in your locality. Teachers of special subjects such as music, printing, and shorthand often can give information about occupations related to the subjects they teach.

Public libraries have books, pamphlets, and magazine articles with occupational information. The librarian can help you a great deal in directing you to the information best suited to your needs.

Business establishments are often willing to supply information about the work they perform, the types of jobs they have available, and the qualifications needed. The names of local firms can be found in the classified section of your telephone directory or can be obtained from your local chamber of commerce. If the firm is a large one, it's a good idea to contact the director of personnel.

Trade unions, employers' associations, and professional societies frequently have local branches. Often, staff members can supply career information for the occupations or industries with which they are concerned.

Private employment agencies can provide a great deal of information and assistance to jobseekers. These agencies, which ordinarily charge a fee for their services, employ counselors to assist clients with their career planning and placement. Because they are located in cities and towns throughout the country, private employment agencies can be an excellent source of information about job opportunities in local areas. They are listed in local telephone directories, and advertise in newspapers and magazines.

State Employment Service offices are in a particularly good position to provide information about jobs, hiring standards, and wages in your locality. Public Employment Service agencies in each State are affiliated with the U.S. Employment Service of the U.S. Department of Labor, and provide their services without charge. Operating through a network of local offices, State agencies help jobseekers find employment and help employers find qualified workers.

Whether you are looking for a job right now, or exploring career possibilities for the future, your local Employment Service office can be a help. Depending on your particular needs, you can obtain information on jobs in your local area, employment counseling, referral to training programs, and placement services, as follows:

Information on local job opportunities can be obtained from the Job Information Service (JIS). These special units have been set up in many local offices of the Employment Service. They permit jobseekers to select jobs from a computerized listing of opportunities in the area. These listings, which are updated daily, provide information from employers on specific openings. The JIS also furnishes general information on occupational trends, industrial developments, job opportunities in State and Federal Government, and promotional materials from associations and unions. Information on jobs in other parts of the country is available as well.

Employment counseling is available from trained Employment Service counselors to assist young people starting their careers, as well as experienced workers interested in changing jobs. Counselors help

people determine their actual and potential abilities, interests, and personal traits, to help them make the best use of their capacities in the light of available jobs. Most counselors in Employment Service offices make use of USES aptitude tests when appraising an individual's aptitudes, interests, and clerical and literary skills.

Referral to training programs is another service. When individuals seek work for which they are not qualified, the Employment Service may suggest programs that provide training in basic education or a specific skill.

Placement services also are available. Placing workers in jobs is a primary objective of the public Employment Service, and registered applicants are directed to employers who have vacancies to fill. Requests are received from employers for many different kinds of workers. As a result, registered applicants have access to knowledge of a variety of vacancies, just as the employer has access to many applicants.

Certain groups of jobseekers are given special consideration by public employment offices. These include veterans legally entitled to priority in all services, with preferential treatment for disabled veterans over others. In addition, the Vietnam Era Veterans Readjustment Assistance Act requires that some specific form of assistance, designed to enhance employment prospects, be given to each veteran who applies to the Employment Service. Each local office has a veterans' employment representative assigned the responsibility of seeing that these priority services are provided by all local office staff.

The Employment Service also maintains a year-round program of services for youth, including counseling, job development, placement, training, and referral to other agencies. Special efforts include the Summer Employment Program, in which the Employment Service tries to develop as many jobs as possible for disadvantaged youth. Another special program provides placement services to graduating seniors, school dropouts, and potential dropouts who want to work.

Other groups facing special difficulties in obtaining suitable employment are given special consideration by the Employment Service, too. This may include referral for supportive services, such as provision of child care to enable the parent to work, or health examinations or referral to training which will help develop the jobseeker's employability. For individuals with mental or physical disabilities, assistance in making realistic job choices and overcoming problems related to getting and holding jobs is available. For middle-aged and older workers placement efforts which take into account their particular problems have been developed. Similar attention is given to the unique employment problems of minority group members, and to the difficulties encountered by disadvantaged job seekers.

ASSUMPTIONS AND METHODS USED IN PREPARING EMPLOYMENT PROJECTIONS

Although the discussions of future job prospects contained in the *Handbook* are written in qualitative terms, the analyses upon which they are based begin with quantitative estimates of projected employment, replacement openings, and—in a few cases—supply.

These projections were developed using data on population, industry and occupational employment, productivity, consumer expenditures, technological innovation, and other factors expected to affect employment growth. The Bureau's other research programs provided much of this data, but many other agencies of the Federal Government were important contributors, including the Bureau of Apprenticeship and Training and the U.S. Employment Service, Manpower Administration, Department of Labor; the Bureau of the Census, Department of Commerce; the Office of Education and the Rehabilitation Services Administration, Department of Health, Education, and Welfare; the Veterans Administration; the Civil Service Commission; the Interstate Commerce Commission; the Civil Aeronautics Board; the Federal Communications Commission; the Department of Transportation; and the National Science Foundation.

In addition, experts in industry, unions, professional societies, and trade associations furnished data and supplied information through interviews. Many of these individuals also reviewed preliminary drafts of the statements. The information presented in each statement thus reflects the knowledge and judgment not only of the Bureau of Labor Statistics staff, but also of leaders in the fields discussed, although the Bureau, of course, takes full responsibility.

After the information from these sources was compiled, it was analyzed in conjunction with the Bureau's model of the economy in 1985. Like other models used in economic forecasting, it encompasses the major facets of the economy and represents a comprehensive view of its projected structure. The bureau's model is comprised of internally consistent projections of gross national product (GNP) and its components—consumer expenditures, investment, government expenditures, and net exports; industrial output and productivity; labor force; average weekly hours of work; and employment for detailed industry groups and occupations. The methods used to develop the employment projections in this edition of the *Handbook* are the same as those used in other Bureau of Labor Statistics studies of the economy. A detailed description of these methods appears in *The U.S. Economy in 1985*, BLS Bulletin 1809.

Assumptions. The Bureau's projections to 1985 are based on the following general assumptions:

The institutional framework of the U.S. economy will not change radically.

Current social, technological, and scientific trends will continue, including values placed on work, education, income, and leisure.

The economy will gradually recover from the high unemployment levels of the mid-1970's and reach full employment (defined as 4 percent unemployment) in the mid-1980's.

No major event such as widespread or long-lasting energy shortages or war will significantly alter the industrial structure of the economy or alter the rate of economic growth.

Trends in the occupational structure of industries will not be altered radically by changes in relative wages, technological changes, or other factors.

Methods. Beginning with population projections by age, sex, and race developed by the Bureau of the Census, a projection of the total labor force is derived using expected labor force participation rates for each of these groups. In developing the participation rates, the Bureau takes into account a variety of factors that affect a person's decision to enter the labor market, such as school attendance, retirement practices, and family responsibilities.

The labor force projection is then translated into the level of GNP that would be produced by a fully employed labor force. Unemployed persons are subtracted from the labor force estimate and the result is multiplied by a projection of output per worker. The estimates of future output per worker are based on analysis of trends in productivity growth among industries and changes in the average weekly hours of work.

Next, the projection of GNP is divided among its major components

Consumer expenditures, business investment, government expenditures—Federal, State, and local—and net exports. Each of these components is broken down by producing industry. Thus, consumer expenditures, for example, is divided among industries producing goods and services such as housing, food, automobiles, medical care, and education.

Once estimates are developed for these products and services, they are translated into detailed projections of industry output, not only for the industries producing the final product, but also for the intermediate and basic industries which provide the raw materials, electric power, transportation, and other inputs required in the production process. To facilitate this translation, the Department of Commerce has developed input-output tables which indicate the amount of output produced by each industry—steel, glass, plastics, etc.—that is required to produce a final product, automobiles for example.

By using estimates of future output per man-hour based on studies of productivity and technological trends for each industry, it is possible to derive industry employment projections from the output estimates.

These projections are then compared with employment projections derived using regression analysis. This analysis develops equations that relate employment by industry to combinations of economic variables, such as population and income, that are considered determinants of long-run changes in employment. By comparing projections resulting from input-output and regression analysis, it is possible to identify areas where one method produces a projection inconsistent with past trends or the Bureau's economic model, and adjust the projections accordingly.

Occupational employment projections. Projections of industry employment are translated into occupational employment projections using an industry-occupation matrix. This matrix, which is divided into 200 industry sectors and 400 occupation sectors, describes the current and expected occupational structure of each industry. By applying the projected patterns of occupational structure for each industry to the industry employment projection and aggregating the resulting estimates, employment projections for each of the 400 occupations contained in the matrix can be obtained.

In some cases employment is related directly to one of the components of the Bureau's model—for example, the number of cosmetologists is related to consumer expenditures for beauty shop services. In others, employment is related to an independent variable not explicitly projected in the model, but believed to be a primary determinant of employment in that occupation. The projection of automobile mechanics, for example, is based on the expected stock of motor vehicles. Projections that are developed independently are compared with those in the matrix and revised, if necessary, to assure consistency.

Replacement needs. In addition to developing an estimate of projected employment for each occupation, a projection is made of the number of workers who will be needed as replacements. Separations constitute a significant source of openings. In most occupations, more workers are needed to replace those who retire, die, or leave the occupation than are needed to fill jobs created by growth. Consequently, even declining occupations offer employment opportunities.

To estimate replacement openings, the Bureau has developed tables of working life based on actuarial experience for deaths and on decennial census data on general patterns of labor force participation by age and sex. Withdrawals from each occupation are calculated separately for men and women by age group and used to compute an overall separation rate for the occupation. These rates are used to estimate average annual replacement needs for each occupation over the projection period.

The effects of interoccupational transfers are not taken into account when calculating replacement needs because little information is as yet available on this type of separation.

Supply. Supply estimates used in analysis of certain *Handbook* occupations represent the numbers of workers who are likely to enter a particular occupation if past trends of entry to the occupation continue. These estimates are developed independently of the demand estimates. Thus, supply and demand are not discussed in the usual economic sense in which wages play a major role in equating supply and demand. Statistics on college enrollments and graduations by field are the chief sources of information on the potential supply of personnel in professional, technical, and other occupations requiring extensive formal education. Data on persons completing apprenticeship programs provide some information on new entrants into skilled trades. The Bureau recently issued *Occupational Supply: Concepts and Sources of Data for Manpower Analysis* (BLS Bulletin 1816, 1974). This bulletin explores several aspects of occupational supply.

TOMORROW'S JOBS

Young people face the difficult task of choosing sound career plans from among thousands of alternatives. As the economy continues to expand, creating many new kinds of jobs, this planning becomes even more difficult. This *Handbook* provides occupational information intended to aid students, counselors, parents, and teachers in examining the large number of options open to tomorrow's worker.

Many questions are important to young persons as they attempt to match their abilities and interests with the variety of occupational choices. What fields look promising for employment opportunities? What education and training are required to enter particular jobs? How do earnings in certain occupations compare with earnings in others requiring similar training? What types of employers provide which kinds of jobs? Does employment in a particular job mean steady, year-round work or is the job seasonal or affected by minor swings in economic activity?

The answers to these questions change as our economy grows. New goods, services, and improved methods of production, as well as changes in living standards, life styles, and government policy constantly alter the types of jobs that become available. This section explores how changes in our industrial and economic framework affect the outlook for employment in specific occupations. It also discusses the implications of these changes for career education and vocational training.

No one can forecast the future with certainty. Nevertheless, by using the wealth of information available, and economic and statistical analysis, the work future can be broadly sketched. Of course, some aspects of the future can be predicted more accurately than others. For example, the population in 1985 can be estimated with a high degree of accuracy because changes in the rate of population growth occur very slowly. On the other hand, forecasting employment in a specific occupation is quite difficult. The demand for scientists, for example, would change quite rapidly if a major research and development program were initiated.

But before projecting the demand for workers in the economy, a number of basic assumptions must be made about broad national policy and social, technological, and business conditions. The employment outlook pictured in the *Handbook* is drawn within the following fundamental assumptions.

The institutional framework of the U.S. economy will not change radically.

Current social, technological, and scientific trends will continue, including values placed on work, education, income, and leisure.

The economy will gradually recover from the high unemployment levels of the mid-1970's and reach full employment, (4 percent unemployment) in the mid-1980's.

No major event such as widespread or long-lasting energy shortages or war will significantly alter the industrial structure of the economy or alter the rate of economic growth.

Trends in the occupational structure of industries will not be altered radically by changes in relative wages, technological changes, or other factors.

The *Handbook's* assessment of industrial and occupational outlook begins with a projection of the total labor force. By 1985, approximately 109.7 million persons will be in the labor force, according to projections developed by the Bureau of Labor Statistics in January 1975. About 2.1 million will be members of the Armed Forces; the remainder makes up the civilian labor force—107.7 million. This represents an 18-percent increase over 1974.

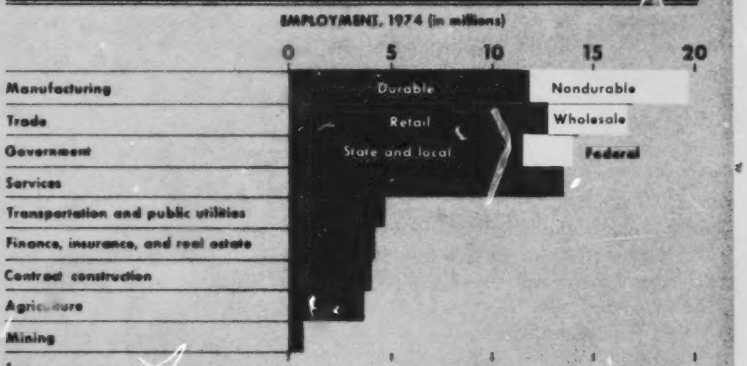
The growth of individual industries and occupations will differ, however, from that of the total labor force. The following sections discuss the projected growth of industries and occupations, and describe the effect of this growth on tomorrow's jobs.

Industrial Profile

To help understand the Nation's industrial composition, industries may be viewed as either goods-producing or service-producing. They may further be grouped into nine major divisions according to product or service. (See chart 1.)

Most of the Nation's workers are in industries that produce services, in activities such as education, health care, trade, repair and maintenance, government, transportation, banking, and insurance. The production of goods—raising food crops, building, extracting minerals, and manufacturing—requires only about one-third of the country's work force. (See chart 2.) In

Where People Work[1] 1



[1] Wage and salary workers except Agriculture which includes self-employed and unpaid family workers.

Source: Bureau of Labor Statistics

general, job growth through the mid-1980's is expected to continue to be faster in the service-producing industries than in the goods-producing industries. However, among industry divisions within both the goods-producing and service-producing sectors, the growth pattern will continue to vary. (See chart 3.)

Service-producing industries. In 1974, about 53.7 million workers were on the payroll of service-producing industries—trade; government; services and miscellaneous; transportation and other utilities; and finance, insurance, and real estate—about 19.8 million more than the number employed in 1960. The major factors underlying this rapid growth were (1) population growth; (2) increasing urbanization with its accompanying need for more city services; and (3) rising incomes and living standards accompanying a demand for improved services, such as health and education. These factors are expected to continue to result in rapid growth of service industries as a group, and they are expected to employ 71.5 million by 1985, an increase of about 33 percent over the 1974 level.

Trade, the largest division within the service-producing industries, has expanded sharply since 1960. Wholesale and retail outlets have multiplied in large and small cities to satisfy the need of our highly urban society. Employment in trade was about 17 million in 1974, about 49 percent above the 1960 level.

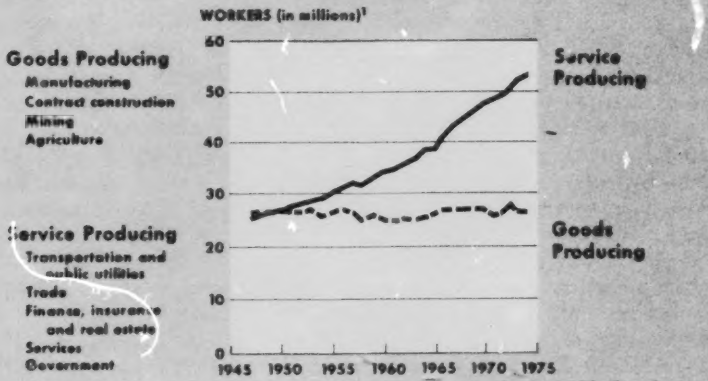
Employment in trade is expected to grow by about 22 percent between 1974 and 1985. Although an ever-increasing volume of merchandise will be distributed as a result of increases in population and consumer expenditures, the rate of increase in manpower needs will be slowed by laborsaving technology such as the greater use of electronic data processing equipment and automated warehousing equipment, and by growth in the number of self-service stores, and vending machines.

Government employment has grown faster than any other industry division, and increased by about 70 percent, from 8.4 million to 14.5 million, between 1960 and 1974. Growth has been mostly at the State and local levels, which together expanded by 90 percent. Employment growth has been greatest in agencies providing education, health, sanitation, welfare, and protective services. Federal Government employment increased about 20 percent between 1960 and 1974.

Government will continue to be a major source of new jobs through the mid-1980's Employment in government will grow faster than the average for other industries, rising about 35 percent over the 1974 total. Most of the growth will occur in State and local agencies; while at the Federal level, employment will grow more slowly than the average.

Service and miscellaneous industries have increased rapidly as a result of the growing need for health services, maintenance and repair, advertising, and domestic help. From 1960 to 1974, total em-

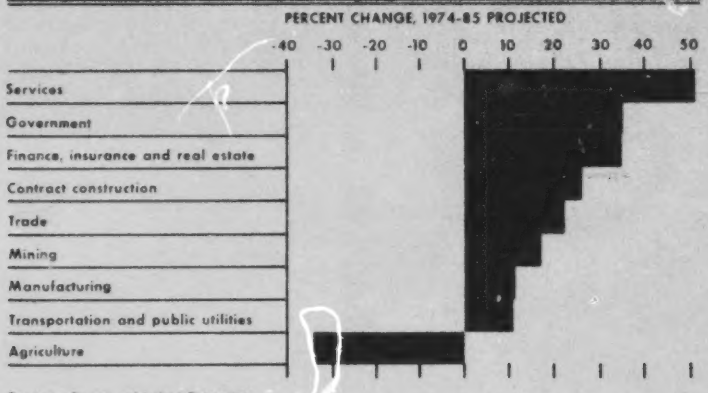
Industries Providing Services Offer More Jobs Than Those Providing Goods 2



[1] Wage and salary workers, except Agriculture, which includes self-employed and unpaid family workers.

Source: Bureau of Labor Statistics

Through the Mid-1980's Employment Growth Will Vary Widely, by Industry 3



Source: Bureau of Labor Statistics

ployment in this industry division rose by over 80 percent, from 7.4 million to about 13.5 million.

Service and miscellaneous industries will continue to be among the fastest-growing industries through the mid-1980's. More than half again as many workers are expected to be employed in this industry division in 1985 as in 1974. Manpower requirements in health services are expected to grow rapidly due to population growth and the increasing ability of persons to pay for health care. Business services, including accounting, data processing, and maintenance, also are expected to grow rapidly.

Transportation and public utility employment in 1974, at 4.7 million, was about 17 percent higher than in 1960. Different parts of this industry, however, have experienced different growth trends. For example, employment increased rapidly in air transportation, but declined in the railroad industry.

The number of jobs in transportation and public utilities as a whole is expected to increase by 11 percent to 1985, less than the average for other industries. Widely differing employment trends will continue to be experienced among individual industries within the division. A continued increase in employment is expected in air transportation, and a decline is expected to continue in railroad employment. A slight decline is expected in water transportation.

Finance, insurance, and real estate, the smallest of the service-producing industry divisions, grew by about 56 percent from 1960, to more than 4.1 million in 1974. Employment has grown especially rapidly in banks; in credit agencies; and among security and commodity brokers, dealers, exchanges, and services.

Job growth in finance, insurance, and real estate will outpace the overall increases in nonfarm employment through the mid-1980's. 1985 employment will be about 35 percent higher than in 1974.

Goods-Producing Industries. Employment in the goods-producing industries—agriculture, manufacturing, construction, and mining—at more than 28.1 million in 1974 has increased slowly in recent years. Significant gains in productivity resulting from automation and other technological developments as well as the growing skills of the work force have permitted large increases in output without corresponding increases in employment. Overall, employment in goods-producing industries is expected to increase more slowly than the average for other industries. However, widely different patterns of employment changes have occurred and will continue among the industry divisions in the goods-producing sector.

Agriculture, which until the late 1800's employed more than half of all workers in the economy, employed about 4 percent, or 3.5 million workers, in 1974. Increases in the average size of farms, rapid mechanization, and improved fertilizers, feeds, and pesticides have created large increases in output even though employment has fallen sharply.

The worldwide demand for food is increasing rapidly. Although farm employment in 1985 will be below the 1974 level, the rate of decline will be slower than during the 1960's.

Mining employment, at about 672,000 workers in 1974, has declined nearly 6 percent since 1960, primarily because of labor-saving technological changes. The overall trend is expected to change, and mining employment in 1985 should be about 17 percent higher than in 1974. Coal mining will be a major source of new jobs as the cost of other fuels continues to rise and efficient ways are found to minimize the environmental impact of mining.

Contract construction employment, about 4 million in 1974, has increased about 38 percent since 1960 as a result of the Nation's growing need for homes, apartments, offices, stores, highways, and other physical facilities.

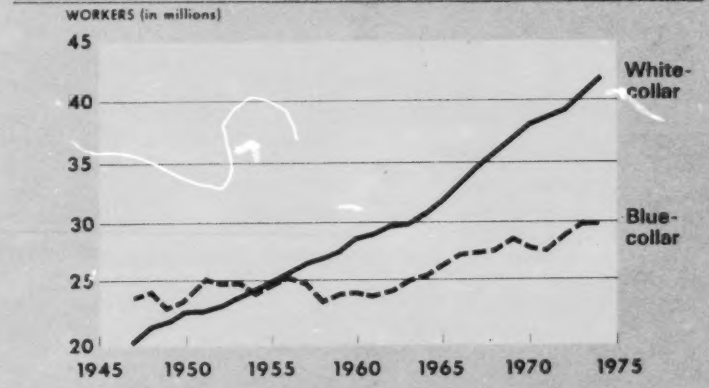
Between 1974 and 1985, employment in contract construction is expected to grow about as fast as the average for other industries rising by 26 percent.

Manufacturing, the largest division within the goods-producing sector, had about 20 million workers in 1974, an increase of about

19 percent over 1960. New products for industrial and consumer markets and the rapid growth of government expenditures for defense and space programs spearheaded growth during the 1960's.

Manufacturing employment is expected to increase more slowly than the average for other industries through the mid-1980's and to reach about 22.2 million in 1985. Employment in durable goods manufacturing is projected to increase at a slightly faster rate than total manufacturing, and nondurable goods, somewhat more slowly; however, the rate of growth will vary among the individual manufacturing industries.

Employment Has Shifted Toward White-Collar Occupations 5



Source: Bureau of Labor Statistics

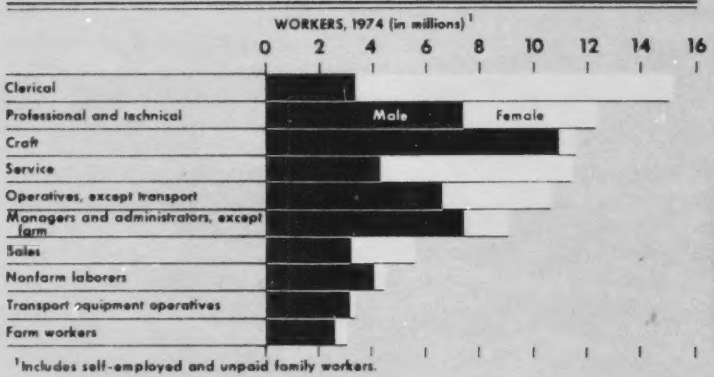
Occupational Profile

As industries continue to grow, changes will take place in the Nation's occupational structure. Jobs will become more complex and specialized offering an even greater number of occupational choices to persons planning a career. By first studying the outlook for broad occupational groups, the task can be made more manageable. (See chart 4.)

Among the broad occupational groups, white-collar jobs have grown most rapidly. In 1974, white-collar workers—professional, managerial, clerical, and sales—outnumbered blue-collar workers—craftworkers, operatives, and laborers by almost 12 million. (See chart 5.)

Through the mid-1980's, we can expect a continuation of the rapid growth of white-collar and service occupations, a slower-than-average growth of blue-collar occupations, and a further decline of farm workers. The rapid growth expected for white-collar and service workers reflects continuous expansion of the service-producing industries, which employ a relatively large proportion of these workers. The growing demand for workers to perform research and development, to provide education and health services, and to process the increasing amount of paperwork throughout all types of enterprises, also will be significant in the growth of white-collar jobs. The slower-than-average growth of blue-collar and farm workers reflects the expanding use of labor-saving equipment in our Nation's industries and the relatively slow growth of the goods-producing industries that employ large proportions of blue-collar workers. (See chart 6.)

Employment in Major Occupational Groups, by Sex 4



[1]Includes self-employed and unpaid family workers.

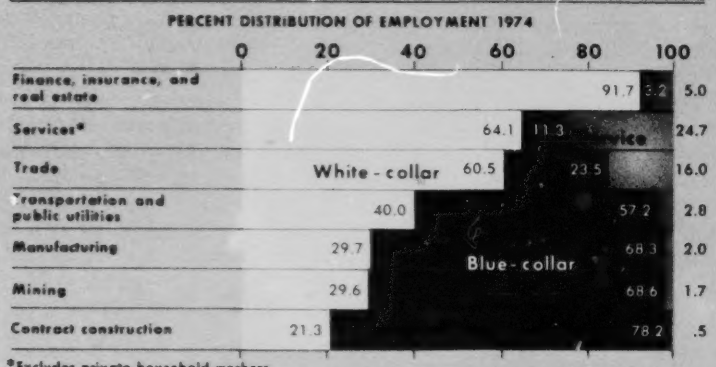
Source: Bureau of Labor Statistics

The following sections describe in greater detail the changes that are expected to occur among the broad occupational groups through the mid-1980's.

Professional and technical workers, the third largest occupational group in 1974, at 12.3 million, include such highly trained personnel as teachers, dentists, accountants, and clergy.

Professional occupations will grow by about 30 percent between

Industries Differ in the Kinds of Workers They Employ 6



Source: Bureau of Labor Statistics

1974 and 1985—second only to clerical occupations in terms of growth rate. (See chart 7.) Professional workers in this area will be in great demand as the Nation makes greater efforts in transportation, energy production, rebuilding the cities, and enhancing the beauty of the land. The quest for scientific and technical knowledge is bound to grow, raising the demand for workers in scientific and technical specialties. The late 1970's and early 1980's will see a continuing emphasis on the social sciences and medical services.

Managers and administrators totaled about 8.9 million in 1974. As in the past, requirements for salaried managers are likely to continue to increase rapidly because of the growing dependence of business organizations and government agencies on management specialists. On the other hand, the number of self-employed managers is expected to continue to decline as the trend toward larger businesses continues to restrict growth of the total number of firms, and as supermarkets continue to replace small groceries and general stores. Overall, the number of managers will increase about as fast as the average for other occupations.

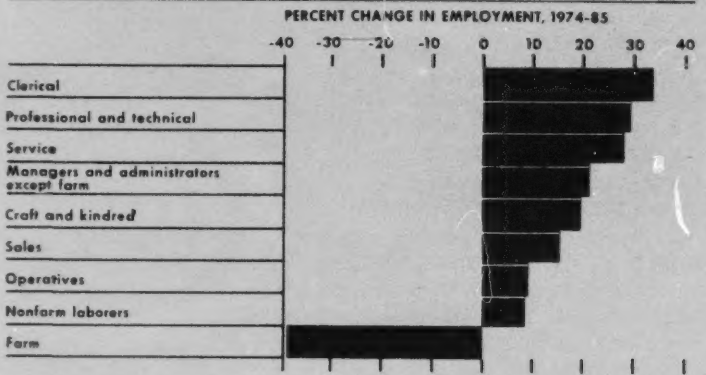
Clerical workers, numbering 15 million made up the largest group of workers in 1974. They are expected to be the fastest growing group during the 1974–85 period—increasing about one-third. Included in this category are workers who operate computers and office machines, keep records, take dictation, and type. Many new clerical made up the largest group of workers in 1974. Many new clerical positions are expected to open up as industries employing large numbers of clerical workers continue to expand. The demand will be strong for those qualified to handled jobs created by electronic data processing operations.

Sales workers, accounting for about 5.4 million workers in 1974, are found primarily in retail stores, manufacturing and wholesale firms, insurance companies, real estate agencies, as well as offering goods door-to-door. Salesworkers are expected to increase about 16 percent between 1974 and 1985. Salesworker employment will grow as population growth and business expansion increase the demand for a wide range of goods and services.

Craft workers, numbering about 11.5 million in 1974, include a wide variety of occupations such as carpenters, tool and diemakers, instrument makers, all-round machinists, electricians, and typesetters. Industrial growth and increasing business activity will spur the growth of craft occupations through the mid-1980's. However, technological developments will tend to limit the expansion of this group. Employment craft workers is expected to increase about as fast as the average for all occupations, rising to nearly 20 percent by 1985.

Operatives made up the second largest major occupational group in

Through the Mid-1980's Employment Growth Will Vary Widely among Occupations 7



Source: Bureau of Labor Statistics

1974, with about 13.9 million workers engaged in such activities as assembling goods in factories; driving trucks, buses, and taxis and operating machinery.

Employment of operatives is expected to increase about 9 percent by 1985, more slowly than the average for other occupations. Technological advances will reduce employment for some types of semiskilled occupations. Increases in production, as well as the trend toward motor truck transportation of freight, are expected to be major factors contributing to the overall employment increase.

Laborers (excluding those in farming and mining), numbered nearly 4.4 million workers in 1974. They move, lift, and carry materials and tools in the Nation's workplaces. Employment of laborers is expected to increase only about 9 percent between 1974 and 1985 in spite of the rises in manufacturing and construction, where most are employed. Increased demand is expected to be offset by rising productivity resulting from continued substitution of mechanical equipment for manual labor.

Service workers, including men and women who maintain law and order, assist professional nurses in hospitals, give haircuts and beauty treatments, serve food, and clean and care for our homes, totaled about 11.4 million in 1974. This diverse group is expected to increase 28 percent between 1974 and 1985. Some of the main factors that are expected to increase requirements for these occupations are the rising demand for hospital and other medical care; the greater need for protective services as urbanization continues and cities become more crowded; and the more frequent use of restaurants, beauty salons, and other services as income levels rise and an increasing number of housewives take jobs outside the home. The employment of private household workers, however, will continue to fall despite a rise in demand for their services. Fewer persons will accept household employment because of low wages and the strenuous nature of the work.

Farm workers—including farmers, farm managers, laborers, and supervisors—numbered nearly 3.1 million in 1974. The demand for food products, both at home and for export, will continue to grow rapidly. Farm employment, however, will decline through the mid-1980's as farm technology continues to improve.

Job Openings

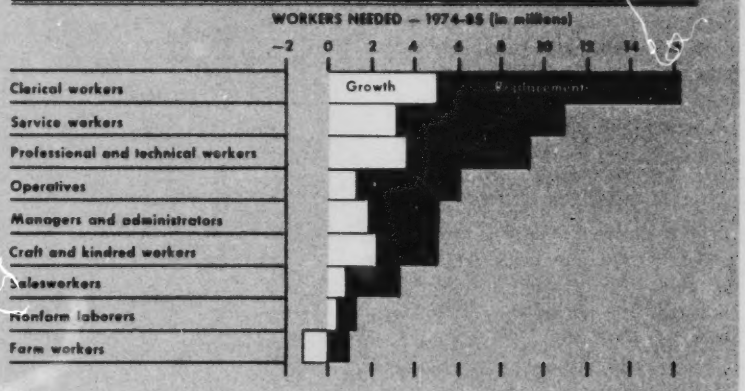
In considering careers, young people should not eliminate an occupation just because it will not be among the fastest growing. Although growth is an indicator of future job outlook, it is not the only factor. More jobs will be created between 1974 and 1985 from deaths, retirements, and other labor force separations than from employment growth. (See chart 8.) Replacement needs will be particularly significant in occupations which have a large proportion of older workers. Furthermore, an occupation with many workers, even though it may have little prospects for growth, may offer more openings than a fast-growing, small one. For example, among the major occupational groups, openings for operatives resulting from growth and replacements combined will be greater than for craftsmen, although the rate of growth in the employment of craftsmen will be considerably more rapid than the rate of growth for operatives.

Outlook and Education

Numerous opportunities for employment will be available for skilled jobseekers during the years ahead. Employers are seeking people who have higher levels of education because many jobs are more complex and require greater skill. Furthermore, employment growth generally will be faster in those occupations requiring the most education and training. For example, employment in clerical and professional and technical jobs will grow faster than in all other occupational groups.

A high school education has become standard for American

Training Needs Are Determined by Replacement Plus Growth 8



Source: Bureau of Labor Statistics

workers. Thus, a high school graduate is in a better competitive position in the job market than a nongraduate.

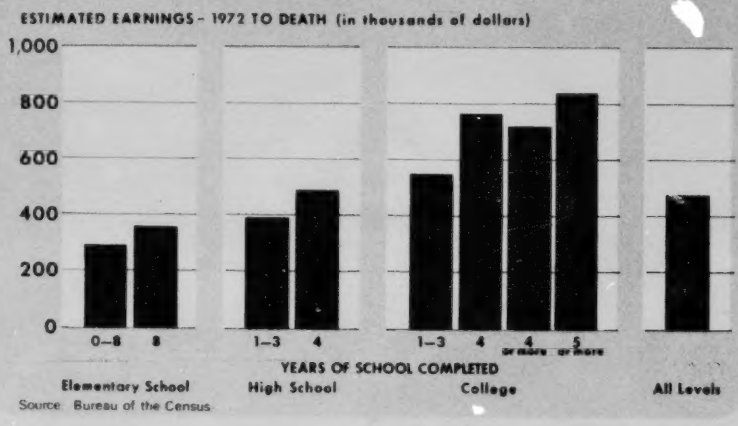
Although training beyond high school has been the standard for some time for many professional occupations, other areas of work also require more than a high school diploma. As new, automated equipment is introduced on a wider scale in offices, banks, insurance companies, and government operations, skill requirements are rising for clerical and other jobs. Employers increasingly are demanding better trained workers to operate complicated machinery. In many areas of sales work, developments in machine design, use of new materials, and the complexity of equipment are making greater technical knowledge a requirement. Because many occupations are becoming increasingly complex and technical, specific occupational training such as that obtained through apprenticeship, junior and community colleges, and post-high school vocational education courses is becoming more and more important to young people preparing for successful careers.

Young persons who do not get good preparation for work will find the going more difficult in the years ahead. Employers will be more likely to hire workers who have at least a high school diploma. Furthermore, present experience shows that the less education and training a worker has, the less chance he has for a steady job. (See chart 9.)

In addition to its importance in competing for jobs, education makes a difference in lifetime income. According to the most recently available data, men who had college degrees could expect to earn about $760,000 in their life times, or nearly two and three quarters times the $280,000 likely to be earned by workers who had less than 8 years of schooling, nearly twice the amount earned by workers who had 1 to 3 years of high school, and more than 1 1/2 times as much as high school graduates. Clearly the completion of high school pays a dividend. A worker who had only 1 to 3 years of high school could expect to earn only about $45,000 more than workers who had an elementary school education, but a high school graduate could look forward to a $135,000 lifetime income advantage over an individual completing elementary school. (See chart 10.)

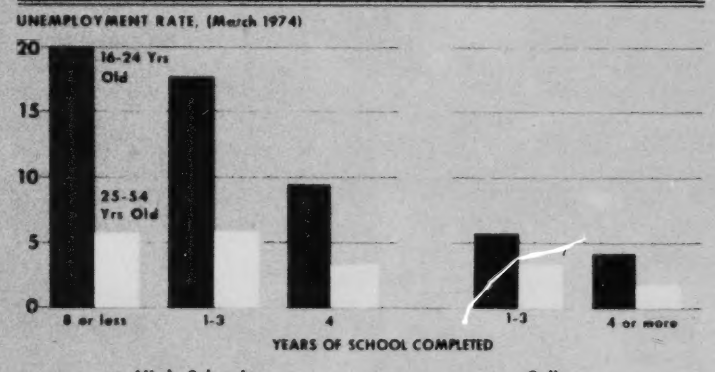
In summary, young people who have acquired skills and a good basic education will have a better chance for interesting work, good wages, and steady employment. Getting as much education and training as one's abilities and circumstances permit should therefore be a top priority for today's youth.

Estimated Lifetime Earnings for Men Tend to Rise with Years of School Completed 10



Source: Bureau of the Census

Unemployment Rates Are Highest for Young Workers 9



Source: Bureau of Labor Statistics

THE OUTLOOK FOR OCCUPATIONS

INDUSTRIAL PRODUCTION AND RELATED OCCUPATIONS

Millions of people who work in industrial production help to ensure the continued growth of our economy and its smooth operation. These skilled and semiskilled blue-collar workers are involved in almost every production process.

Workers in this group are employed mostly in factories. Machinists and machine tool operators shape metal to precise sizes. Assemblers put together automobiles, television sets, and hundreds of other products. Inspectors examine and test products to assure quality. Printing craft workers operate the various types of machinery used to print newspapers, books, and other publications. Some factory workers are not directly involved in the production process, but support it in some way. Stationary engineers, for example, operate boilers and other equipment. Millwrights move and install heavy industrial machinery. Power truck operators move materials about the plant.

Industrial workers also are employed outside of manufacturing in a variety of activities. Automobile painters, for example, restore the finish on old and damaged cars. Photographic laboratory workers develop film and make prints and slides.

Semiskilled workers, such as assemblers and power truck operators, ordinarily need only brief on-the-job training. Skilled workers, such as stationary engineers and machinists, require considerable training to qualify for their jobs. Many learn their trades on the job, but training authorities generally recommend completion of a 3- or 4-year apprenticeship program as the best way to learn a skilled trade.

Most jobs in industrial production do not require a high school diploma. However, many employers prefer high school or vocational school graduates who have taken courses such as blueprint reading and machine shop.

Growth rates for individual occupations in industrial production will differ greatly. Employment of welders, for example, is expected to rise faster than the average for all occupations in the Nation's work force as a result of growth in the metalworking industries and the wider use of welding. Employment of assemblers is expected to grow about the same as the average, despite the continued automation of assembly processes. Employment in some printing crafts, on the other hand, is expected to decline as a result of more efficient printing methods. Even in most declining occupations, however, some job openings are expected as experienced workers retire, die, or transfer to other fields.

This chapter includes statements on 21 industrial production and related occupations. Many other workers who are involved in industrial production are described elsewhere in the *Handbook* because of their close association with particular occupational groups. For example, engineers are included in the chapter on Scientific and Technical Occupations.

FOUNDRY OCCUPATIONS

Foundry workers produce metal castings for numerous industrial and household products that range from machine tools to bathtubs. Casting is a method of forming metal into intricate shapes. Molten metal is poured into carefully prepared molds and allowed to solidify.

The *patternmaker*, the *molder*, and the *coremaker* each play an important part in the process. The *patternmaker* makes a wood or metal model of the casting. A *molder* places it in a box and packs sand around the model to form a mold. If the casting is to have a hollow section, a *coremaker* makes a core of packed and hardened sand that is positioned in the mold before the molten metal is poured in.

In 1974, about 21,000 patternmakers, 60,000 molders, and 25,000 coremakers worked in the foundry industry. About three-fourths of them worked in shops that make and sell castings. The remainder worked in plants that make and use castings in their final products, such as plants operated by manufacturers of automobiles or machinery.

A high school education is the minimum requirement for an apprentice in patternmaking and for more skilled molding and coremaking jobs. An eighth grade education, however, may be enough for entry into many molding and coremaking jobs.

Employment in these trades is expected to show little or no change through the mid-1980's because of automation and other laborsaving improvements in production methods. Nevertheless, the need to replace experienced workers who die, retire, or transfer to other occupations will provide some job openings. The number of openings may fluctuate from year to year because foundry employment is sensitive to ups and downs in the economy.

Patternmakers, molders, and coremakers are discussed in detail in the following statements. (For a general description of many other jobs involved in metal casting, see the statement on Foundries elsewhere in the *Handbook*.)

Sources of Additional Information

For details about training opportunities for patternmakers, molders, and coremakers, contact local foundries, the local office of the State employment service, the nearest office of the State apprenticeship agency, or the Bureau of Apprenticeship and Training, U.S. Department of Labor. Information also is available from the following organizations:

American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill. 60016.

International Molders' and Allied Workers' Union, 1225 E. McMillan St., Cincinnati, Ohio 45206.

Cast Metals Federation, Cast Metals Federation Building, 20611 Center Ridge Rd., Rocky River, Ohio 44116.

PATTERNMAKERS

Nature of the Work

Foundry patternmakers are highly skilled craft workers who make the patterns used in making molds for metal castings. Most of the workers in the occupation are *metal patternmakers* (D.O.T. 600.280); a smaller number are *wood patternmakers* (D.O.T. 661.281). Some patternmakers work with both metal and wood as well as plaster and plastics.

Patternmakers work from blueprints prepared by engineers. They make a precise pattern for the product, carefully checking each dimension with instruments such as micrometers and calipers. Precision is important because any imperfections in the pattern will be reproduced in the castings made from it.

Wood patternmakers select the woodstock, lay out the pattern, and saw each piece of wood to size. They then shape the rough pieces into final form with various woodworking machines, such as lathes and sanders, as well as many small handtools. Finally, they assemble the pattern segments by hand, using glue, screws, and nails.

Metal patternmakers prepare patterns from metal stock or from rough castings made from a wood pattern. To shape and finish the patterns, they use many metalworking machines, including lathes, drill presses, shapers, milling machines, power hacksaws, and grinders. They also use small handtools.

Training, Other Qualifications, and Advancement

Apprenticeship is the best means of qualifying as an experienced patternmaker. Because of the high degree of skill and the wide range of knowledge needed for patternmaking, it is difficult to learn the trade on the job. In some instances, skilled machinists have been able to transfer to metal patternmaking with additional on-the-job training or experience. Trade school courses in patternmaking provide useful preparation for the prospective ap-

Patternmaker checks dimensions of wooden pattern.

prentice, and may be credited toward completion of the apprenticeship.

The usual apprenticeship period for patternmaking is 5 years. Each year at least 144 hours of classroom instruction usually are provided. Apprenticeship programs for wood and metal patternmaking are separate. Employers generally require apprentices to have a high school education.

Apprentices begin by helping experienced patternmakers in routine duties. They make simple patterns under close supervision; as they progress, the work becomes increasingly complex and the supervision more general. Patternmakers earn higher pay as their skill increases, and some become supervisors.

Patternmaking, although not strenuous, requires considerable standing and moving about. Manual dexterity is especially important because of the precise nature of the work. The ability to visualize objects in three dimensions is also important.

Employment Outlook

Employment of foundry patternmakers is expected to show little or no change through the mid-1980's despite the anticipated increases in foundry production. The increased use of metal patterns and other technical improvements in patternmaking will prevent any significant employment growth. Metal patterns, unlike wooden ones, can be used again and again, thus reducing the number of patterns that have to be made.

Although employment is not expected to grow significantly, some job openings will arise because of the need to replace experienced pattermakers who retire, die, or transfer to other occupations. Most of these openings will be for metal patternmakers. The number of openings may fluctuate from year to year since the demand for foundry products is sensitive to changes in the economy.

Because patternmakers learn either basic metalworking or woodworking they are prepared for jobs in related fields when patternmaking employment is not available. Wood patternmakers can qualify for woodworking jobs such as cabinetmakers, and metal patternmakers can transfer their skills to metalworking jobs such as machinists.

Earnings and Working Conditions

Patternmakers generally have higher earnings than other production workers in manufacturing. In January 1975, average straight-time hourly earnings of wood patternmakers ranged from $5.25 in gray iron and malleable iron foundries, to $5.55 in nonferrous foundries, according to a wage survey made by the National Foundry Association. Metal patternmakers' earnings generally were higher. In comparison, all production workers in manufacturing averaged $4.65 an hour.

Patternmakers work indoors in well-lighted, well-ventilated areas. The rooms in which they work are generally separated from the areas where the casting takes place, so they are not exposed to the heat and noise of the foundry floor.

For sources of additional information, see the introductory section of this chapter.

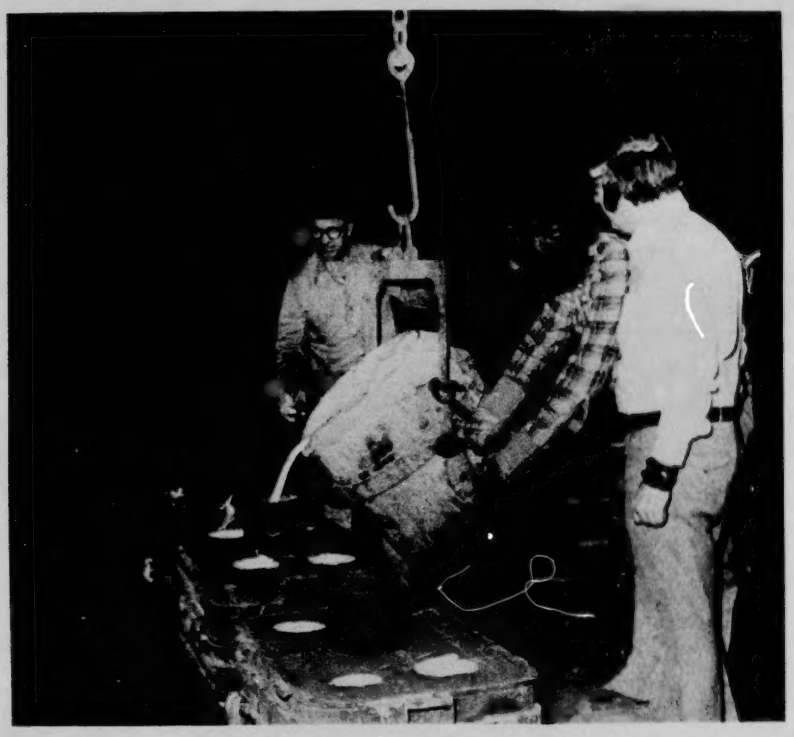
MOLDERS

Nature of the Work

The molder prepares a mold which contains a hollow space in the shape of the item to be made. The mold is made by packing and ramming specially prepared sand around a pattern—a model of the object to be duplicated—in a box called a flask. A flask is usually made in two parts which can be separated to remove the pattern without damaging the mold cavity. When molten metal is poured into the cavity, it soldifies and forms the casting.

Most of the workers in this occupation are machine molders; the rest are hand molders. *Machine molders* (D.O.T. 518.782) operate machines that simplify and speed the making of large quantities of identical sand molds. Machine molders assemble the flask and pattern on the machine table, fill the flask with prepared sand, and operate the machine with levers and pedals. Many of these workers set up and adjust their own machines.

Hand molders use primarily manual methods to construct the sand molds. Power tools, such as pneumatic rammers, and handtools, such as trowels and mallets, are used to smooth the sand. Molds for small castings are usually made on the workbench by *bench molders* (D.O.T. 518.381); those for large and bulky castings are made on the foundry floor by *floor molders* (D.O.T. 518.381). An all-round hand molder makes many different types of molds. A less-skilled molder specializes in a few simple types.



Molders pour liquified metal into molds.

Training, Other Qualifications, and Advancement

Completion of a 4-year apprentice program, or equivalent experience, is needed to become a skilled hand molder. Workers with this training also are preferred for some kinds of machine molding but in general a shorter training period is required in order to become a qualified machine molder. Some people learn molding skills informally on the job, but this way of learning the trade takes longer and is less reliable than apprenticeship.

An eighth grade education usually is the minimum requirement for apprenticeship. Many employers, however, prefer high school school graduates.

Apprentices, under close supervision by skilled molders, begin with simple jobs, such as shoveling sand, and gradually take on more difficult and responsible work, such as ramming molds, withdrawing patterns, and setting cores. They also learn to operate the various types of molding machines. Beginning with simple shapes and advancing to more complex work, they make complete molds as training progresses. In addition, the apprentice may work in other foundry departments to develop all-round knowledge of foundry methods and practices. The apprentice usually receives at least 144 hours of classroom instruction each year in subjects such as shop arithmetic, metallurgy, and shop drawing.

Hand molders who do highly repetitive work usually learn their jobs during a brief training period. Trainees work with a molder to make a particular kind of mold. After 2 to 6 months, the trainee usually is capable of making a similar mold. Most machine molding jobs can be learned in 2 to 3 months on the job.

Physical standards for molding jobs are fairly high. Hand molders stand at their work, move about a great deal, and frequently must lift

heavy objects. They need good vision and a high degree of manual dexterity. Molders may advance to a specialized molding job or eventually to a supervisory position.

Employment Outlook

Employment of molders is expected to show little or no change through the mid-1980's. The trend to more machine molding, such as the sand slinging process, and other laborsaving innovations will limit employment growth. Nevertheless, the need to replace experienced molders who retire, die, or transfer to other occupations will provide some job openings. The number of openings, however, may fluctuate from year to year because the demand for foundry products is sensitive to changes in the economy.

Earnings and Working Conditions

In January 1975, floor molders averaged $4.75 an hour and bench molders averaged $4.55, according to a wage survey made by the National Foundry Association. Molders who were paid on an incentive basis generally had higher earnings. By comparison, production workers in all manufacturing industries averaged $4.65 an hour.

Working conditions vary considerably from one foundry to another. Heat and fumes have been greatly reduced in many plants by the installation of improved ventilation systems and air- conditioning.

For sources of additional information, see the introductory section of this chapter.

COREMAKERS

Nature of the Work

Coremakers prepare the "cores" that are placed in molds to form the hollow sections in metal castings. The poured metal solidifies around the core, so that when the core is removed the desired cavity or contour remains.

A core may be made either by hand or machine. In both instances, sand is packed into a block of wood or metal in which a space of the desired size and shape has been hollowed out. After the core is removed from this box it is hardened by baking or by another drying method. When hand methods are used, the coremaker uses mallets and other handtools to pack sand into the core box. Small cores are made on the workbench by *bench coremakers* (D.O.T. 518.381) and large ones are made on the foundry floor by *floor coremakers* (D.O.T. 518.381).

Machine coremakers (D.O.T. 518.885) operate machines that make sand cores by forcing sand into a core box. Some machine coremakers are required to set up and adjust their machines and do finishing operations on the cores. Others are primarily machine tenders. They are closely supervised and their machines are adjusted for them. (To see how the coremaker's job is a basic step in the casting process, read the description of sand casting given in the statement on Foundries elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

Completion of a 4-year apprentice training program or the equivalent experience is needed to become a skilled hand coremaker. Apprenticeships also are sometimes required for the more difficult machine coremaking jobs. Apprenticeship training in coremaking and molding often are combined.

Experienced coremakers teach apprentices how to make cores and operate ovens. Classroom instruction covering subjects such as arithmetic and the properties of metals generally supplements on-the-job training. Coremakers earn higher pay as their skill increases, and some become supervisors.

An eighth grade education usually is the minimum requirement for coremaking apprentices; some

Coremaker operates machine that produces cores for automobile engine heads.

employers require graduation from high school. Some types of hand coremaking require a high degree of manual dexterity.

Employment Outlook

Employment of coremakers is expected to show little or no change through the mid-1980's. Growth in this occupation will be limited as more cores are made by machine instead of by hand. Nevertheless, some job openings will arise because of the need to replace experienced coremakers who retire, die, or transfer to other occupations. The number of openings may fluctuate from year to year since the demand for foundry products is sensitive to changes in the economy.

Earnings and Working Conditions

In January 1975, the average hourly earnings of floor coremakers were $4.65; bench coremakers, $4.35; and machine coremakers, $4.05, according to a wage survey made by the National Foundry Association. Coremakers who were paid on an incentive basis generally had higher earnings. By comparison, production workers in all manufacturing industries averaged $4.65 an hour.

Working conditions vary considerably from one foundry to another. Heat and fumes have been greatly reduced in many plants by the installation of improved ventilation systems and air-conditioning. Although the injury rate in foundries is higher than the average for manufacturing, coremaking is one of the least hazardous foundry jobs.

For sources of additional information, see the introductory section of this chapter.

MACHINING OCCUPATIONS

Nearly every product made by American industry contains metal parts or is manufactured by machines made of metal parts. In 1974, over 1.1 million machinists, machine tool operators, tool and diemakers, and setup workers used a wide variety of machine and handtools to shape these metal parts.

A machine tool is a stationary, power-driven device that brings together the cutting instrument (tool) and the metal to be cut, holding them. Some of the most common machine tools are lathes and machines that drill, bore, mill, and grind. Metal can be shaped also by using chemicals, electricity, magnetism, sound, light, and liquids under controlled conditions.

All-round machinists can operate most types of machine tools, whereas machine tool operators generally work with one kind only. Tool and diemakers make dies (metal forms) for presses and diecasting machines, devices to guide drills into metal, and special gauges to determine whether the work meets specified tolerances. Instrument makers use machine tools to produce highly accurate instrument parts from metal and other materials. Setup workers adjust tools for semiskilled machine tool operators to run. (Detailed discussions of work performed, training, and earnings of these occupations are presented in the chapters that follow.)

ALL-ROUND MACHINISTS

(D.O.T. 600.280, .281, and .381)

Nature of the Work

All-round machinists, who can set up and operate most types of machine tools, use these tools to make metal parts. Because they plan and carry through all operations, they may switch from one product to another and give variety to their work. Their knowledge of metals and machine tools enables them to turn a block of metal into an intricate part of precise specifications. They select tools and materials for each job and plan the cutting and finishing operations from a blueprint or written specifications. They make standard shop computations relating to dimensions of work and machining specifications. They often use precision measuring instruments, such as micrometers, to measure the accuracy of their work to thousandths or even millionths of an inch. After completing machining operations, they may use hand files and scrapers before assembling the finished parts with wrenches and screwdrivers.

Machinist adjusts high-speed machine tool.

Machinists who make and repair metal parts in maintenance departments must have a broad knowledge of the way machines work to adjust and test parts. In plants that produce large numbers of metal products, highly skilled machinists specialize in layout work and mark specifications on metal for machine tool operators who do the machining operations.

Places of Employment

An estimated 335,000 machinists were employed in 1974. Almost every factory using substantial amounts of machinery employed all-round machinists to maintain its mechanical equipment. Some all-round machinists made large quantities of identical parts in production departments of metalworking factories; others made limited numbers of varied products in machine shops. Most all-round machinists worked in the following industries: machinery, including electrical; transportation equipment; fabricated metal products; and primary metals. Other industries employing substantial numbers of these workers were the railroad, chemical, food processing, and textile industries. The Federal Government also employed all-round machinists in Navy yards and other installations.

Although machinists work in all parts of the country, jobs are most plentiful in areas where many factories are located. Among the leading areas of employment are Los Angeles, Chicago, New York, Philadelphia, Boston, San Francisco, and Houston.

Training, Other Qualifications, and Advancement

A 4-year formal apprenticeship is the best way to learn the machinist trade, but some companies have training programs for single-purpose machines that require less than 4 years. Many machinists, however, learn on the job.

Persons interested in becoming machinists should be mechanically inclined and temperamentally suited to do highly accurate work that requires concentration as well as physical effort. Prospective machinists should be able to work independently. Although the work is sometimes tedious and repetitious, all-round machinists frequently have the satisfaction of seeing the final results of their work.

A high school or vocational school education, including mathematics, physics, or machine shop training, is desirable. Some companies require experienced machinists to take additional courses in mathematics and electronics at company expense so that they can service and operate numerically controlled machine tools. In addition, equipment builders generally provide training in the electrical, hydraulic, and mechanical aspects of machine-and-control systems.

Typical machinist apprentice programs consist of approximately 8,000 hours of shop training and about 570 hours of related classroom instruction. In shop training, apprentices learn chipping, filing, hand tapping, dowel fitting, riveting, and the operation of various machine tools. In the classroom, they study blueprint reading, mechanical drawing, shop mathematics, and shop practices.

All-round machinists have numerous opportunities for advancement. Many advance to supervisory jobs. Some take additional training and become tool and die or instrument makers. Skilled machinists may open their own shops or advance into other technical jobs in machine programming and tooling.

Employment Outlook

The number of all-round machinists is expected to increase at about the same rate as the average for all occupations through the mid-1980's. Expansion of metalworking activities will cause most of the increase. In addition to openings created by growth in this large occupation, many openings will arise from the need to replace experienced machinists who retire, die, or transfer to other fields of work.

As population and income rise, so will the demand for machined goods, such as automobiles, household appliances, and industrial products. However, technological developments which increase the productivity of machinists are expected to keep employment from rising as fast as the demand for machined goods.

Chief among these technological innovations is the expanding use of numerically controlled machine tools. These machines, which translate numbers into a series of motions or processes, significantly reduce the time required to perform machining operations.

Much of the employment growth will occur in maintenance shops, as industries continue to use a greater volume of complex machinery and equipment. Skilled maintenance machinists are needed to prevent costly breakdowns in highly mechanized plants. In such plants, a breakdown of one machine may stop many other machines.

Earnings and Working Conditions

The earnings of machinists compare favorably with those of other skilled workers. Machinists averaged $5.56 an hour in 1973-74, according to a survey of metropolitan areas. Average hourly rates in 14 of the areas surveyed, selected to show how wage rates differ in various parts of the country, appear in the accompanying tabulation.

Area	*Hourly rate*
San Francisco–Oakland	$6.48
Detroit	6.46
New York	6.13
Chicago	6.04
Minneapolis–St. Paul	5.99
Portland, Oreg	5.85
Buffalo	5.79
Louisville	5.66
Los Angeles–Long Beach	5.64
Houston	5.59
Cleveland	5.49
Denver	5.25
Boston	5.02
Greenville, S.C	4.04

Machinists must follow strict safety regulations when working around high-speed machine tools. Short-sleeved shirts, safety glasses, and other protective devices are required to reduce accidents. Most shops are clean and workplaces are well-lighted.

Many machinists are members of unions including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America; the International Union of Electrical, Radio and Machine Workers; the International Brotherhood of Electrical Workers; and the United Steelworkers of America.

Sources of Additional Information

The National Machine Tool Builders Association, 7901 Westpark Dr., McLean, Va. 22101–whose members build a large percentage of all machine tools used in this country–will supply, on request, information on career opportunities in the machine tool industry.

The National Tool, Die and Precision Machining Association,

9300 Livingston Rd., Oxon Hill, Md. 20022, offers information on apprenticeship training, including Recommended Apprenticeship Standards for Tool and Die Makers certified by the U.S. Department of Labor's Bureau of Apprenticeship and Training.

The Tool and Die Institute, 777 Busse Highway, Park Ridge, Ill. 60068—a trade association—offers information on apprenticeship training in the Chicago area.

Many local offices of State employment services provide free aptitude testing to persons interested in becoming all-round machinists or tool and diemakers. In addition, the State employment service refers applicants for apprentice programs to employers. In many communities, applications for apprenticeship also are received by labor-management apprenticeship committees.

Apprenticeship information also may be obtained from the following unions (which have local offices in many cities):

International Association of Machinists and Aerospace Workers, 1300 Connecticut Ave. NW., Washington, D.C. 20036.

International Union, United Automobile, Aerospace and Agricultural Implement Workers of America, Skilled Trades Department, 8000 East Jefferson Ave., Detroit, Mich. 48214.

International Union of Electrical Radio and Machine Workers, 1126 16th St. NW., Washington, D.C. 20036.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

INSTRUMENT MAKERS (MECHANICAL)

(D.O.T. 600.280)

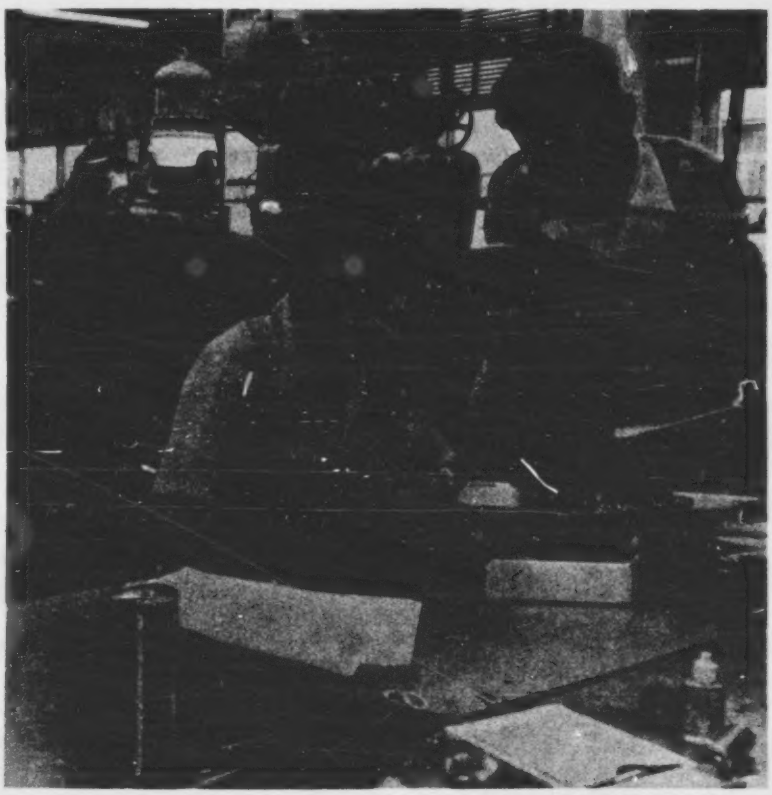
Nature of the Work

Instrument makers (also called experimental machinists and modelmakers) work closely with engineers and scientists in translating designs and ideas into experimental models, special laboratory equipment, and custom instruments. Experimental devices constructed by these craft workers are used, for example, to regulate heat, measure distance, record earthquakes, and control industrial processes. The parts and models may range from simple gears to intricate parts of navigation systems for guided missiles. Instrument makers also modify existing instruments for special purposes.

Instrument makers fabricate metal parts using machine tools such as lathes and milling machines, and handtools such as files and chisels. Because accuracy is important, they measure finished parts with a wide variety of precision measuring equipment, including micrometers, verniers, calipers, and dial indicators, as well as standard optical measuring instruments.

Using considerable imagination and ingenuity, they work from rough sketches, verbal instructions, or ideas, as well as from detailed blueprints. Sometimes specifications must not vary more than 10 millionths of an inch. To meet these standards, they use special equipment or precision devices, that other machining workers seldom use, such as the electronic height gauge. They also work with a variety of materials, including plastics and rare metals such as titanium and rhodium.

Instrument makers may construct, assemble, and then test all parts of an instrument in small shops. When working with electrical and electronic components that are to be incorporated into an instrument, however, they frequently work with other instrument makers or electronic specialists.



Instrument makers work closely with engineer and scientists.

Places of Employment

Many of the approximately 5,500 instrument makers employed in 1974 worked for firms that manufactured instruments. Others were in research and development laboratories that make special devices for scientific research. The Federal Government employed many instrument makers.

The main centers of instrument making are located in and around a few large cities, particularly New York, Chicago, Los Angeles, Boston, Philadelphia, Washington, Detroit, Buffalo, and Cleveland.

Training, Other Qualifications, and Advancement

Some instrument makers advance from the ranks of machinists or skilled machine tool operators. These craft workers begin by doing the simpler jobs under close supervision. Usually 1 to 2 years or more of instrument shop experience are needed to qualify as instrument makers.

Other instrument makers learn their trade through apprenticeships that generally last 4 years. A typical 4-year program includes 8,000 hours of shop training and 576 hours of related classroom instruction. Shop training emphasizes the use of machine tools, handtools, and measuring instruments, and the working properties of various materials. Classroom instruction covers related technical subjects such as mathematics, physics, blueprint reading, chemistry, metallurgy, electronics, and fundamental instrument design. Apprentices must learn enough shop mathematics to plan their work and to use formulas. A basic knowledge of mechanical principles is needed in solving gear and linkage problems.

For apprenticeship programs, employers generally prefer high school graduates who have taken algebra, geometry, trigonometry, science, and machine shopwork. Further technical schooling in electricity, physics, machine design, and electronics is often desirable, and may make possible future promotions to technician jobs.

Persons interested in becoming instrument makers should be those having a strong interest in mechanical subjects and better-than average ability to work with their hands. They must have initiative and resourcefulness because instrument makers often work alone under minimum supervision or none. Since instrument makers often face new problems, they must be able to develop original solutions. Frequently, they must visualize the relationship between individual parts and the complete instrument, and must understand the principles of the instrument's operation. Because of the nature of their jobs, instrument makers have to be very conscientious and take considerable pride in creative work.

As instrument makers' skills and knowledge improve, they may advance to more responsible positions. For example, they may plan and estimate time and material requirements for the manufacture of instruments or provide specialized support to professional personnel. Others may become supervisors and train less skilled instrument makers.

Employment Outlook

Job opportunities are expected to be relatively scarce in the years ahead. Some workers will be needed to replace experienced instrument makers who retire, die, or find other jobs, but replacement needs will be small because so few people are employed in this field. Employment growth will create a small number of additional job openings.

Employment of instrument makers is expected to increase at a slower rate than the average for all occupations through the mid-1980's. Some additional workers will be needed to make models of new instruments for mass production and also to make custom or special instruments, particularly in the expanding field of industrial automation. Also, more versatile and sensitive precision instruments can be expected to emerge from current research and development programs. Laborsaving technological innovations, however, will limit employment growth. Numerically controlled machine tools, for example, reduce the amount of labor required in machining operations.

Earnings and Working Conditions

Earnings of instrument makers compare favorably with those of other highly skilled metalworkers. In 1973-74, instrument makers generally earned between $5 and $7 an hour.

Instrument shops usually are clean and well-lighted, with temperatures strictly controlled. Instrument assembly rooms are sometimes known as "white rooms," for almost sterile conditions are maintained.

Serious work accidents are not common, but machine tools and flying particles may cause finger, hand, and eye injuries. Safety rules generally require the wearing of special glasses, aprons, tightly fitted clothes, and short-sleeved shirts.

Many instrument makers are union members. Among the unions representing them are the International Association of Machinists and Aerospace Workers; the International Brotherhood of Electrical Workers; the International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America.

Sources of Additional Information

See list under this same heading in the statement on all-round machinists elsewhere in the *Handbook*.

MACHINE TOOL OPERATORS

(D.O.T. 602., 603., 604., 605., and 606.)

Nature of the Work

Many machine tool operators do simple, repetitive jobs that can be learned quickly on one or two types of machine tools. Other more skilled workers do complex and varied machining operations on several different machine tools.

Typically, semiskilled operators place rough metal stock in a machine tool on which the speeds and operation sequence already have been set. By using special, easy-to-use gauges they watch the machine and make minor adjustments. However, they depend on skilled machining workers for major adjustments when their machine is not working properly.

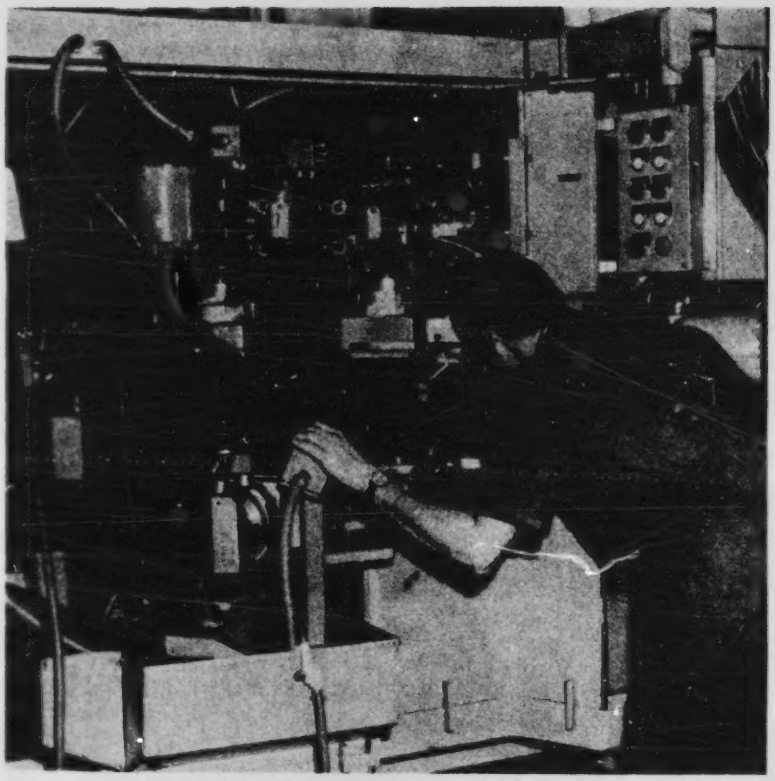
Skilled machine tool operators plan and set up the correct sequence of machining operations according to blueprints, layouts, or other instructions. They adjust speed, feed, and other controls, and select the proper cutting instruments or tools for each operation. Using micrometers, gauges, and other precision measuring instruments, they check the completed work with the tolerance limits given in the specifications. They also may select cutting and lubricating oils to cool metal and tools during machining operations.

Operators use lathes, drill presses, and automatic screw machines. They also use boring, grinding, and milling machines. Both skilled and semiskilled operators have job titles related to the kind of machine they operate, such as engine lathe operator, milling machine operator, and drill press operator.

Places of Employment

About 600,000 machine tool operators were employed in 1974, mainly in factories that produce fabricated metal products, transportation equipment, and machinery in large quantities. Skilled machine tool operators worked in production departments, maintenance departments, and toolrooms.

Machine tool operators work in every State and in almost every city in the United States. However, they are concentrated in major industrial areas such as the Great Lakes Region: About one-fourth of all machine tool operators work in the Great Lakes cities of Detroit, Flint, Chicago, Cleveland, and Milwaukee. Among the other areas that have large numbers of these workers are Los Angeles, Philadelphia, St. Louis, and Indianapolis.



Operator adjusts machine that drills and reams rifle parts.

Training, Other Qualifications, and Advancement

Most machine tool operators learn their skills on the job. Beginners usually start by observing skilled operators at work. When trainees first operate a machine, they are supervised closely by more experienced workers. Beginners learn how to use measuring instruments and to make elementary computations needed in shopwork. They gradually acquire experience and learn to operate a machine tool, read blueprints, and plan the sequence of machining work.

Individual ability and effort largely determine the time required to become a machine tool operator. Most semiskilled operators learn

their jobs in a few months, but a skilled operator often requires 1 to 2 years. Some companies have formal training programs for new employees.

Although no special education is required for semiskilled jobs, persons seeking such work can improve their opportunities by completing courses in mathematics and blueprint reading. In hiring beginners, employers often look for persons with mechanical aptitude and some experience working with machinery. Physical stamina is important since much time will be spent standing. Applicants should be able to work independently within a relatively small work area. Although much of the work is tedious, many machine tool operators derive satisfaction from seeing the results of their work.

Skilled machine tool operators may become all-round machinists, tool and diemakers, or advance to jobs in machine programming and maintenance.

Employment Outlook

Job opportunities for machine tool operators should be fairly plentiful in the years ahead. Because this is a large occupation, many openings arise due to the need to replace operators who retire, die, or transfer to other fields of work. Some openings also will result from employment growth, although employment of machine tool operators is expected to grow more slowly than the average for all occupations through the mid-1980's.

More machine tool operators will be needed as metalworking industries expand their output. However, the use of faster and more versatile automatic machine tools and numerically controlled machine tools will result in greater output per worker and tend to limit employment growth. Other factors that may slow the growth in this occupation are the increasingly important new processes in metal removal, such as electrical discharge and ultrasonic machining, and the use of powdered metals that reduce the machining necessary for a final product.

Workers with thorough backgrounds in machining operations, mathematics, blueprint reading, and a good working knowledge of the properties of metals will be better able to adjust to the changing job requirements that will result from technological advances.

Earnings and Working Conditions

Machine tool operators are paid according to hourly or incentive rates, or on the basis of a combination of both methods. Skilled operators averaged $5.67 an hour in 1973-74, according to a survey of metropolitan areas. By comparison, nonsupervisory workers in private industry, except farming, averaged $4.05. Average hourly rates in 14 of the areas surveyed, selected to show how wage rates of machine tool operators differ in various parts of the country, appear in the accompanying tabulation.

Area	*Hourly rate*
Detroit	$6.56
San Francisco–Oakland	6.32
Chicago	5.96
Cincinnati	5.53
Los Angeles–Long Beach	5.35
Portland, Oreg.	5.24
Denver	5.19
Minneapolis–St. Paul	5.17
Baltimore	5.09
Boston	4.93
Houston	4.93
Waterbury, Conn.	4.60
Worcester, Mass.	4.57
Tampa–St. Petersburg	4.02

Most shops are clean and workplaces are well-lighted. Machine tool operators must use protective glasses and may not wear loose-fitting garments when working around high-speed machine tools.

Most machine tool operators belong to unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America; the International Union of Electrical, Radio and Machine Workers; the International Brotherhood of Electrical Workers; and the United Steelworkers of America.

Sources of Additional Information

See the list under this same heading in the statement on All-round Machinists elsewhere in the *Handbook*.

SETUP WORKERS (MACHINE TOOLS)

(D.O.T. 600.380)

Nature of the Work

Setup workers, often called machine tool job setters, are skilled specialists employed in plants and machine shops that do machining in large volume. Their main job is to prepare machine tools for use (setup), and to explain to semiskilled workers the operations to be performed and ways to check the accuracy of the work. Usually setup workers are assigned a number of machine tools that are of one type, such as turret lathes. However, they may set up several different kinds. Working from drawings, blueprints, written specifications, or job layouts, they determine the rate at which the material is to be fed into the machines, operating speeds, tooling, and operation sequence. They then select and install the proper cutting or other tools and adjust guides, stops, and other controls. They may make trial runs and adjust the machine and tools until the parts produced conform to specifi-

cations. The machine is then turned over to a semiskilled operator.

Places of Employment

Most of the estimated 50,000 setup workers in 1974 were employed in factories that manufactured fabricated metal products, transportation equipment, and machinery. These workers usually were employed by large companies that employed many semiskilled machine tool operators. They are not usually employed in maintenance shops or in small jobbing shops.

Setup workers are found in every State. However, employment is concentrated in major industrial areas such as Los Angeles, Philadelphia, New York, Chicago, Detroit, and Cleveland.

Training, Other Qualifications, and Advancement

Setup workers must qualify as all-round machinists. They must be able to operate one or more kinds of machine tools and select the sequence of operations so that metal parts will be made according to specifications. The ability to communicate clearly is important in explaining the machining operations to semiskilled workers. Setup workers may advance within a shop or transfer into other jobs, such as parts programmer.

Employment Outlook

Employment of setup workers is expected to increase more slowly than the average for all occupations through the mid-1980's. Although consumer and industrial demand for machined goods will grow, partly offsetting this will be greater productivity of setup workers due to the increasing use of numerically controlled machined tools. Most job opportunities will arise from the need to replace experienced workers who retire, die, or transfer to other occupations.

Set-up worker prepares machine for operation.

Earnings and Working Conditions

The earnings of setup workers compare favorably with those of other skilled machining workers. In 1973-74, setup workers generally earned between $5 and $6 an hour.

Good safety habits are important since setup workers are exposed to high-speed machine tools that have sharp cutting edges.

Many setup workers are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America; and the United Steelworkers of America.

Sources of Additional Information

See list under this same heading in the statement on all-round machinists elsewhere in the *Handbook*.

TOOL-AND-DIE MAKERS

(D.O.T. 601.280, .281, and .381)

Nature of the Work

Tool-and-die makers are highly skilled, creative workers whose products—tools, dies, and special

guiding and holding devices—are used to mass-produce metal parts. Toolmakers produce jigs and fixtures (devices that hold metal while it is shaved, stamped, or drilled). They also make gauges and other measuring devices for manufacturing precision metal parts. Diemakers construct metal forms (dies) to shape metal in stamping and forging operations. They also make metal molds for diecasting and for molding plastics. Tool-and-die makers repair worn or damaged dies, gauges, jigs, and fixtures, and design tools and dies.

Compared with most other machining workers, tool-and-die makers have a broader knowledge of machining operations, mathematics, and blueprint reading, and do precise handwork. Tool-and-die makers use almost every type of machine tool and precision measuring instrument. They work and are familiar with the machining properties of metals and alloys commonly used in manufacturing.

Places of Employment

In 1974, about 170,000 tool-and-die makers were employed, primarily in plants that produce manufacturing, construction, and farm machinery. Others worked in automobile, aircraft, and other transportation equipment industries; small tool-and-die shops; and electrical machinery and fabricated metal industries.

Although tool-and-die makers are situated throughout the country, jobs are most plentiful in areas where many large factories are located. About one-fifth of all tool-and-die makers work in the Detroit and Flint, Chicago, and Los Angeles areas, which are major manufacturing centers for automobiles, machinery, and aircraft, respectively. Among the other areas that have large numbers of these workers are Cleveland, New York, Newark, Dayton, and Buffalo.

Training, Other Qualifications, and Advancement

Tool-and-die making skills can be obtained through formal apprenticeship or equivalent on-the-job training. Applicants should have a good working knowledge of mathematics and physics, as well as considerable mechanical ability, finger dexterity, and an aptitude for precise work.

In selecting apprentices, most employers prefer persons with a high school or trade school education. Some employers test apprentice applicants to determine their mechanical aptitudes and their abilities in mathematics.

Most of the 4 years of a tool and die apprenticeship are spent in practical shop training. Apprentices learn to operate the drill press, milling machine, lathe, grinder, and other machine tools. They also learn to use handtools in fitting and assembling tools, gauges, and other mechanical equipment, and study heat treating and other metalworking processes. Classroom training consists of shop mathematics, shop theory, mechanical drawing, tool designing, and blueprint reading. Several years of experience after apprenticeship are often necessary to qualify for more difficult tool-and-die work. Some companies have separate apprenticeship programs for toolmaking and diemaking.

Some machining workers become tool-and-die makers without completing formal apprenticeships. After years of experience as skilled machine tool operators or machinists, plus additional classroom train-

Tool and die maker must have a broad knowledge of machining operations.

ing, they develop into all-round workers who can skillfully perform tool-and-die making.

Tool-and-die makers may become tool designers or advance to supervisory positions. Some open their own tool-and-die shops.

Employment Outlook

Employment of tool-and-die makers is expected to increase at about the same rate as the average for all occupations through the mid-1980's. Besides the job openings from employment growth, many openings will arise as experienced tool-and-die makers retire, die, or transfer to other fields of work.

The long-range expansion in metalworking industries will result in a continued need for tools and dies. The growth of this occupation may be limited, however, by the use of electrical-discharge machines and numerically controlled machines that have significantly changed toolmaking processes. Numerically controlled machining operations require fewer of the special tools and jigs and fixtures, and could increase the output of each tool-and-die maker.

As a group, tool-and-die makers have a long working life, because their extensive skills and knowledge can be acquired only after many years of experience. Tool-and-die makers also have greater occupational mobility than other less skilled workers, and can transfer to other machining occupations.

Earnings and Working Conditions

Tool-and-die makers are among the highest paid machining workers. Tool-and-die makers averaged $5.98 an hour in 1973-74, according to a survey of metropolitan areas. This was almost one and one-half times as much as the average for all nonsupervisory workers in private industry, except farming. Average hourly rates in 14 of the areas surveyed, selected to show how wage rates for tool-and-die makers differ in various parts of the country, appear in the accompanying tabulation.

Area	*Hourly rate*
San Francisco–Oakland	$7.27
Detroit	6.69
Chicago	6.67
Buffalo	6.21
Cincinnati	5.93
Baltimore	5.84
Atlanta	5.79
Denver	5.70
New York	5.56
Los Angeles–Long Beach	5.56
Dallas	5.28
Houston	5.26
Salt Lake City	4.81
Worcester, Mass.	4.51
Chattanooga	4.36

As with other machining workers, tool-and-die makers wear protective glasses when working around metal cutting machines. Tool-and-die shops are usually safer than similar operations in production plants.

Many tool-and-die makers are members of unions, including the International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America; and the United Steelworkers of America.

Sources of Additional Information

See list under this same heading in the statement on All-round Machinists elsewhere in the *Handbook*.

PRINTING OCCUPATIONS

In 1974, almost 400,000 printing craft workers were employed to produce newspapers, magazines, business forms, and hundreds of other printed materials. Although most worked for publishers and commercial printing shops, many had jobs in insurance companies, paper mills, government agencies, and many other organizations that do their own printing.

Printing craft workers usually specialize in one area of printing operations: Type composition, platemaking, presswork, or binding. The most common way to learn the skills needed in most of these fields is through apprenticeship, which generally lasts from 4 to 6 years. Apprenticeship applicants usually must be high school graduates who are at least 18 years of age, but requirements vary among employers. Most printing craft workers who are covered by union contracts work fewer than 40 hours a week. Some contracts specify a standard workweek of less than 35 hours, but most fall within a 35- to 37-1/2-hour range.

Through the mid-1980's, opportunities to enter printing crafts will stem mainly from the need to replace experienced workers who retire, die, or leave the field for other reasons. Employment growth also will provide job openings in some crafts, but laborsaving technological developments will restrict growth in others.

The statements that follow deal with employment opportunities for the major groups of printing workers: Composing room occupations, photoengravers, electrotypers and stereotypers, printing press operators and assistants, lithographic occupations, and bookbinders.

BOOKBINDERS AND RELATED WORKERS

Nature of the Work

Many printed items, such as books and magazines, must be folded, sewed, stapled, or bound after they leave the printing shops. Much of this work is done by skilled *bookbinders* (D.O.T. 977.781).

Edition-binding—making books in quantity from big, flat printed sheets of paper—is the most complicated kind of binding. Bookbinders first fold the printed sheets into one unit or more, known as a "signature," so that the pages will be in the right order. They then insert any illustrations that have been printed separately, gather and assemble signatures in proper order, and sew them together. They shape the book bodies with presses and trimming machines and reinforce them with glued fabric strips. Covers are glued or pasted onto the book bodies, and then the books undergo a variety of finishing operations and frequently are wrapped in paper jackets. Machines are used extensively throughout the process.

Skilled bookbinders seldom perform all the different binding tasks, but many have had training in all of them. In large shops, skilled bookbinders may be assigned to one or a few operations, most often to the operation of complicated machines, such as rounding and cutting machines.

In many binding shops much of the work is done by bindery workers who are trained in only one operation or in a small number of relatively simple tasks. For example, bindery workers perform such tasks as fastening sheets or signatures together using a machine stapler and feeding signatures into various machines for stitching, folding, or gluing operations.

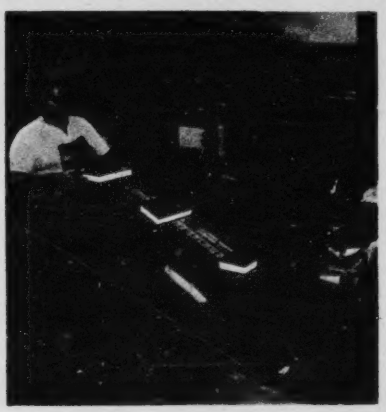
Places of Employment

About 35,000 bookbinders were employed in 1974. Many work in shops that specialize in bookbinding; others work in the bindery departments of book publishing firms, commercial printing plants, and large libraries. Some bookbinders work for the Federal Government.

Although bookbinders work in all parts of the country, employment is concentrated in large printing centers such as New York, Chicago, Los Angeles, and Washington, D.C.

Training and Other Qualifications

A 4- or 5-year apprenticeship, which includes on-the-job training as well as related classroom instruction, generally is required to qualify as a skilled bookbinder. Apprenticeship applicants usually must have a high school education, mechanical aptitude, and be at least 18 years of age. During the apprenticeship, trainees learn to as-



semble signatures; to renovate old, worn bindings; and to use various binding machines, such as puncher and folders.

Most unskilled bindery hands learn their tasks through informal on-the-job training which may last from several months to 2 years. A few learn through formal apprenticeship programs that include classroom instruction as well as on-the-job training.

Employment Outlook

Employment of bookbinders and bindery workers is expected to increase slower than the average for all occupations through the mid-1980's. Most job openings will arise as experienced workers retire, die, or change occupations.

Despite the anticipated growth in the amount of bound printed materials, employment growth will be limited by the increasing mechanization of bindery operations. For example, the use of integral folders which automatically fold pages as they come off the press eliminates the need for bindery workers to do the folding by hand.

Earnings and Working Conditions

Wage rates for skilled bookbinders tend to be below the average for other printing crafts. A survey of union wage rates in 69 large cities showed that the minimum wage rates for bookbinders in publishing firms and bookbinding shops averaged about $6.63 an hour in 1974. This rate was about half above the average for nonsupervisory workers in all private industries, except farming.

The wage rates for bindery workers are considerably lower than the rates for bookbinders, and are among the lowest for printing industry workers. A survey of union wages in 69 large cities shows that in 1974 the average minimum hourly rate for bindery workers was $4.17.

Bookbinding shops tend to be noisy when machinery is operating. Bookbinders have some variety in their jobs, but the jobs of bindery workers tend to be monotonous.

Most bindery workers are members of The Graphic Arts International Union.

Sources of Additional Information

Details about apprenticeship and other training opportunities may be obtained from local bookbinding shops, local offices of the Graphic Arts Union, or the local office of the State employment service.

For general information on bookbinding occupations, write to:

American Newspaper Association, 11600 Sunrise Valley Dr., Reston, Va. 20041.

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

The Graphic Arts International Union, 1900 L St. NW., Washington, D.C. 20036.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

COMPOSING ROOM OCCUPATIONS

(D.O.T. 650.582, 654.782, and 973.381)

Nature of the Work

The printing process begins in a composing room when manuscript copy is set in type, proofed, and checked for errors. Machine and handset type and other materials such as pasteups and photoengravings are assembled and prepared for the pressroom.

Hand compositors (typesetters) (D.O.T. 973.381) make up the oldest composing-room occupation. Today most type that is set by hand is for work that requires special composition—usually larger size type for advertising copy—and for small jobs in which the setting of type by machine would be impractical.

To set type, the compositor reads from the manuscript copy and sets each line of type in a "composing stick" (a device that holds type in place) letter by letter and line by line. When this stick is full, the compositor slides the completed lines onto a shallow metal tray called a "galley."

Typesetting machine operators are craft workers who operate semi-automatic machines which set type much more rapidly than hand methods. Many of these workers specialize in operating linotype, keyboard, casting, or phototypesetting machines.

Linotype (or intertype) machine operators (D.O.T. 650.582), reading from the copy clipped to the machine's copy board, select letters and other characters by operating a keyboard which has 90 keys. As they press the keys, the letters, in forms of metal molds, are assembled into lines of words. As they complete each line, the operators touch a lever and the machine automatically casts the line of type into a solid metal strip called a "slug." The slugs are assembled into the type forms from which either the printing impressions or printing plates are made. Nearly all newspaper plants, large commercial shops, and typographic composition firms use these machines to set type. In small plants, operators also may maintain and repair typesetting machines.

Monotype keyboard operators (D.O.T. 650.582) operate keyboards which are similar to typewriters, but which have about four times as many keys. The keyboard machine produces a perforated paper tape that later is fed into the casting machine by *monotype caster operators* (D.O.T. 654.782). The machine reads the tape and automatically selects the metal molds for each letter. Molten metal is forced into molds to form

Linotype operators set type.

the type. Caster operators insert the tape, adjust and tend the machine while it is operating, and do minor maintenance and repair work.

Phototypesetting machine operators (D.O.T. 650.582) operate high speed typesetting machines. In phototypesetting, a photographic process replaces the function of the hot metal, and the final product is a film or photographic print of the type rather than a metal slug. In a common kind of phototypesetting, perforated paper tape or a magnetic tape is fed into a machine which reads the tape and photographs the individual characters indicated on the tape.

In a more advanced type of phototypesetting, a *cathode-ray tube operator* controls a machine which generates characters from information stored in a computer and displays them on a screen that is similar to a TV picture tube. The characters, as they appear on the face of the screen, are picked up by the lens and exposed onto photographic film or paper. These machines can turn out several thousand characters a second and compose entire pages instead of a line at a time.

In addition to machine operation, phototypesetters must be familiar with the fundamentals of photography, including darkroom procedures, to develop the film. They also make minor repairs on the phototypesetting machine. Much of this equipment has electronic controls and operators need a basic knowledge of the principles of electronics.

Typesetting machine operators also use machines similar to typewriters to set "coldtype" on paper. "Coldtype" composition may be set directly on a paper or metal sheet from which the plate is to be made, or the cold type images may be cut from paper and pasted on layout sheets. The process of assembling and pasting this type on layout sheets is called paste makeup, and is somewhat similar to hand composition. Coldtype composition frequently is used by newspapers for display advertising, and to set regular text copy.

Places of Employment

About 165,000 workers were employed in composing room occupations in 1974. About one-third work for newspaper plants. Many others work for commercial printing plants, book and magazine printers, and Federal, State, and local governments. Some work for banks, insurance companies, advertising agencies, manufacturers, and other firms that do their own printing.

Composing room workers are located in almost every community throughout the country, but they are concentrated in large cities.

Training and Other Qualifications

Most compositors get their skills through apprenticeship training. Others learn while working as shop helpers for several years, or through a combination of trade school and helper experience.

Generally, apprenticeship covers a 6-year period of progressively advanced training, supplemented by classroom instruction or correspondence courses. However, this period may be shortened by as much as 2 to 2-1/2 years for apprentices who have had previous experience or schooling or who show the ability to learn the trade more rapidly.

After basic training as a hand compositor, the apprentice receives intensive training in one specialized field or more, such as in the operation of typesetting machines, including phototypesetting and teletypesetting machines, as well as in specialized work in hand composition and photocomposition.

Applicants for apprenticeship generally must be high school graduates and in good physical condition. They usually are given aptitude tests. Important qualifications include training in mathematics and English, especially spelling. Printing and typing courses in vocational or high schools are good preparation for apprenticeship applicants, and a general background in electronics and photography is becoming increasingly useful. Artistic ability is an asset for a compositor in layout work.

Tape-perforating machine operators must be expert typists. Many technical institutes, junior colleges, and colleges offer courses in printing technology, which provide a valuable background for people who are interested in becoming compositors. They generally learn to type in commercial courses in high school or in business school. These operators do not need to be trained as skilled compositors but they must be familiar with printing terms and measurements. The training period for tape perforating machine operators is about a year.

Employment Outlook

Employment in composing-room occupations is expected to decline through the mid-1980's. Nevertheless, a few thousand job openings are expected each year as ex-

perienced workers retire, die, or change occupations.

In spite of the anticipated expansion in the volume of printing, employment in composing room occupations is expected to decline because of the trend to high-speed phototypesetting and typesetting computers. These high speed machines require fewer operators than the traditional hot metal method of typesetting.

For the jobs that do become available, opportunities should be best for persons who have completed post high school programs in printing technology, such as those offered by technical institutes and junior colleges. Many employers prefer to hire applicants who have completed these programs because the comprehensive training that they receive helps them learn composing room trades and adapt to new processes and techniques more rapidly.

Although most job opportunities will continue to be in the printing industry, a growing number will be found in other industries, such as paper and textile mills, which are doing their own typesetting instead of contracting it to printing firms.

Earnings and Working Conditions

Union compositors on the day shift in newspaper plants had an estimated average minimum rate of $6.86 an hour in 1974, according to a survey of 69 large cities. This rate was about one-half more than the average for nonsupervisory workers in all private industries, except farming.

Working conditions for compositors vary from plant to plant. Some heat and noise are made by typesetting machines. In general, the new plants are well-lighted and clean, and many are air-conditioned. Hand compositors have to stand for long periods and do some heavy lifting. People with some types of physical handicaps, such as deafness, have been able to work in the trade.

Sources of Additional Information

Details about apprenticeship and other training opportunities may be obtained from local employers, such as newspapers and printing shops, the local office of the International Typographical Union, or the local office of the State employment service.

For general information on composing room occupations, write to:

American Newspaper Publishers Association, 11600 Sunrise Valley Dr., Reston, Va. 20041.

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

International Typographic Composition Association, Inc., 2233 Wisconsin Ave. NW., Washington, D.C. 20007.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

ELECTROTYPERS AND STEREOTYPERS

Nature of the Work

Electrotypers (D.O.T. 974.381) and *stereotypers* (D.O.T. 975.782) make duplicate press plates of metal, rubber, and plastic for letterpress printing. These plates are made from the metal type forms prepared in the composing room. Electrotypes are used mainly in book and magazine work. Stereotypes, which are less durable, are used chiefly for newspapers. Electrotyping and stereotyping are necessary because most volume printing requires the use of duplicate plates. When a large edition of a magazine or newspaper is printed, several plates must be used to replace those which become too worn to make clear impressions. Furthermore, many big plants use rotary presses which require curved plates made by either electrotyping or stereotyping from flat type forms.

Electrotypers make a wax or plastic mold of the metal type form which is coated with chemical solutions before being placed in an electrolytic bath containing metal. This leaves a metallic shell on the coated mold. The shell is stripped from the mold, backed with metal or plastic, and carefully finished.

The stereotyping process is simpler, quicker, and less expensive than electrotyping, but it does not yield as durable or as fine a plate. Stereotypers make molds or mats of papermache instead of wax or plastic. The mat is placed on the type form and covered with a cork blanket and a sheet of fiberboard. The covered form is run under heavy steel rollers to impress the type and photoengravings on the mat. Then the mat is placed in a stereotype casting machine which casts a composition lead plate on the mold. In many of the larger plants, automatic machines cast stereotype plates.

Some electrotypers and stereotypers do only one phase of the work, such as casting, molding, or finishing. Others handle many tasks.

Places of Employment

About 4,000 electrotypers and stereotypers were employed in 1974. Many electrotypers work in large plants that print books and magazines. Most stereotypers work for newspaper plants, but some work in large commercial printing plants. Electrotypers and stereotypers also are employed in service shops which do this work for printing firms.

Jobs in these trades can be found throughout the country, but employment is concentrated in large cities.

Training and Other Qualifications

Nearly all electrotypers and

stereotypers learn their trades through 5- to 6-year apprenticeships. Electrotyping and stereotyping are separate crafts and relatively few transfers take place between the two. The apprenticeship program of each trade covers all phases of the work and almost always includes classes in related technical subjects as well as training on the job.

Apprenticeship applicants must be at least 18 years of age and, in most instances, must have a high school education or its equivalent. If possible, this education should include courses in chemistry and machine shop. Physical examinations and aptitude tests usually are given to prospective apprentices.

Employment Outlook

Job opportunities for electrotypers and stereotypers are expected to be scarce through the mid-1980's. Despite the anticipated increase in the volume of printing, employment of electrotypers and stereotypers is expected to decline because of labor saving developments. For example, automatic plate casting eliminates many steps in platemaking. The use of plastic printing plates also requires less labor because such plates are more durable and reduce the demand for duplicate plates. Furthermore, the greater use of offset printing reduces the need for electrotype and stereotype plates, which are not needed in offset printing.

Earnings and Working Conditions

In 1974, union minimum wage rates in 69 large cities averaged $6.22 an hour for electrotypers and $6.69 an hour for stereotypers in book and commercial printing shops. Both averages were considerably higher than the average for nonsupervisory workers in all private industries, except farming.

Much of the work in these trades requires little physical effort since the preparation of duplicate printing plates is highly mechanized. However, some lifting of relatively heavy press plates occasionally is required.

Nearly all electrotypers and stereotypers are members of the International Printing and Graphic Communication's Union.

Sources of Additional Information

Details about apprenticeship and other training opportunities may be obtained from local employers, such as newspapers and printing shops, the local office of the International Printing and Graphic Communications Union, or the local office of the State employment service.

For general information on electrotypers and stereotypers, write to: organizations:

American Newspaper Publishers Association, 11600 Sunrise Valley Dr., Reston, Va. 20041.

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

International Printing and Graphic Communications Union, 1730 Rhode Island Ave. NW., Washington, D.C. 20036.

Printing Industries of America, 1730 N. Lynn St., Arlington, Va. 22201.

LITHOGRAPHIC OCCUPATIONS

Nature of the Work

Lithography, also called offset printing, is one of the most rapidly growing methods of printing. It is a process of photographing the matter to be printed, making a printing plate from the photograph, and pressing the inked plate against a rubber plate which in turn presses it onto the paper.

Several operations are involved in lithography, and each is performed by a specialized group of workers. The main group of lithographic workers includes camera operators, artists, and letterers, strippers, platemakers, and press operators.

Camera operators (D.O.T. 972.382) start the process of making a lithographic plate by photographing and developing negatives of the copy. They generally are classified as line camera operators, halftone operators, or color separation photographers. Negatives may need retouching to lighten or darken certain parts. *Lithographic artists* (D.O.T. 972.281) make these corrections by sharpening or reshaping images on the negatives. They do the work by hand, using chemicals, dyes, and special tools. Like camera operators, they are assigned to only one phase of the work, and may have job titles such as dot etchers, retouchers, or letterers.

Strippers (D.O.T. 971.281) arrange and paste film or prints of type and artwork on the layout sheets from which photographic impressions are made for the press-plates. *Platemakers* (D.O.T. 972.781) cover the surface of the plates with a coating of photosensitive chemicals, or the plate may come with the coating already applied. After exposing the sensitized plate to the negative, they chemically treat the plate to bring out the photographic image.

Lithographic press operators (D.O.T. 651.782) tend lithographic (offset) printing presses. They install plates on the presses and adjust the pressure and water and ink rollers for correct operation. Basically, the duties of these workers are similar to those of letterpress and gravurepress operators.

Places of Employment

Nearly 85,000 skilled lithographic workers were employed in 1974. Many work for commercial printing plants, newspapers, and book and magazine printers. Some work for the U.S. Government Printing Office.

Although lithographic workers are located in all parts of the country, most are employed in large cities.

Training and Other Qualifications

A 4- or 5-year apprenticeship program usually is required in order to become a well-rounded lithographic craft worker. These programs may emphasize a specific craft, such as platemaker or press operator, although an attempt is made to make the apprentice familiar with all lithographic operations.

Usually, apprenticeship applicants must be in good physical condition, high school graduates, and at least 18 years of age. Aptitude tests usually are given to prospective apprentices to determine if they are suited for the work.

Many technical institutes, junior colleges and colleges offer 2-year programs in printing technology, which provide a valuable background for persons who are interested in learning lithographic crafts. High school and vocational school training in printing, photography, mathematics, chemistry, physics, and art also are helpful.

Employment Outlook

Employment of skilled lithographic workers is expected to increase faster than the average for all occupations through the mid-1980's. In addition to the job openings resulting from employment growth, the need to replace workers who retire, die, or change occupations will provide some openings.

Employment of lithographic workers is expected to increase in response to the continued growth of offset printing. Commercial printing firms and newspaper publishers increasingly are using offset presses in place of letterpresses. Employment growth also will be stimulated by the greater use of photographs and drawings in printed matter, and by the more widespread use of color in many printed products.

Employment opportunities should be best for people who have completed post high school programs in printing technology, such as those offered by technical institutes and junior colleges. Many employers prefer to hire applicants who have completed these programs because the comprehensive training that they receive helps them learn lithographic trades and adapt more rapidly to new processes and techniques.

Earnings and Working Conditions

A survey of union wages in 69 large cities shows that in 1974 the average minimum wages for lithographic artists was about $7.90; for platemakers $7.59; and for press operators $7.81. These rates were higher than the average for all nonsupervisory workers in private industries, except farming.

Lithographic workers are on their feet much of the time, but the work is not strenuous. They are sometimes under pressure to meet publication deadlines.

Most lithographic workers are members of the Graphic Arts International Union. A large number of offset press operators are members of the International Printing and Graphic Communications' Union of North America.

Sources of Additional Information

Details on apprenticeship and other training opportunities in lithographic occupations are available from local employers, such as

newspapers and printing shops, local offices of the union previously mentioned, or the local office of the State employment service. For information on schools that offer courses in printing technology, write to:

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

For general information on lithographic occupations, write to:

American Newspaper Publishers Association, 11600 Sunrise Valley Dr., Reston, [illegible] 20041.

Graphic Arts International Union, 1900 L St. NW., Washington, D.C. 20036.

International Printing and Graphic Communications' Union North America, 1730 Rhode Island Ave. NW., Washington, D.C. 20036.

National Association of Printers and Lithographers, 570 7th Ave., New York, N.Y. 10018.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

PHOTOENGRAVERS

(D.O.T. 971.281 and .382)

Nature of the Work

Photoengravers make metal printing plates of pictures and other copy that cannot be set up in type. In letterpress photoengraving, ink is rolled over the printed surface which stands higher than the rest of the plate. When paper is pressed against the raised surface, the print or image is picked up. Similarly, gravure photoengravers make gravure cylinders on which the image is etched below the surface of the cylinder. Ink is placed in the etched or sunken areas, and when paper is pressed against the surface the ink is lifted out and appears on the paper.

In the making of a photoengraving plate for the letterpress process, the entire job may be done either by one worker or by several, each doing a particular operation, such as camera work, printing, and etching. In large shops, however, the work usually is divided among a number of these specialists.

Photoengravers first photograph the material to be reproduced. After developing the negative, they print the image on a metal plate by coating the plate with a solution sensitive to light and then exposing it to the negative. When the plate is placed in an acid bath, the nonimage areas are etched away and the image areas stand out.

The number of photoengraving operations performed depends on the quality of the printing required. Photoengravings for very high quality books or periodicals, for example, require more careful finishing than those for newspapers. Photoengravers use handtools to inspect and touch up the plates. They cut away metal from the nonprinting part of the plate to prevent it from touching the inking rollers during printing.

Gravure photoengraving is like letterpress photoengraving, except that in gravure the image areas rather than the background are etched away.

Places of Employment

An estimated 17,000 skilled photoengravers were employed in 1974. More than half work in commercial shops that make photoengravings for other printing firms. Newspapers and photogravure shops employ several thousand photoengravers. Book and magazine printers and the Federal Government also employ these workers. Many photoengravers have their own shops.

Although photoengravers are located in all parts of the country,

employment is concentrated in large printing centers, such as New York, Chicago, Philadelphia, and Los Angeles.

Training and Other Qualifications

Most photoengravers learn their trade through a 5-year apprenticeship program which includes at least 800 hours of classroom instruction. Apprenticeship applicants must be at least 18 years of age and generally must have a high school or vocational school education or its equivalent, preferably with courses in printing, chemistry, and physics. Many employers require a physical examination for prospective photoengravers. Good eyesight is particularly important because of the close work and color discrimination involved. Also, most apprenticeship candidates have to take an aptitude test to determine if they have the potential to do the work.

Employment Outlook

Employment opportunities for photoengravers are expected to be scarce in the years ahead. Despite the growing use of photographs and other illustrations in publications, employment of photoengravers will decline as many firms switch from letterpress to offset printing, which requires no photoengraving. Also, new technological advances such as color scanners and color enlargers plus the trend toward automated platemaking should reduce the need for these workers. However, a few hundred job openings are expected each year as experienced photoengravers retire, die, or change occupations.

Earnings and Working Conditions

Union photoengravers on the day shift in newspaper plants had an average minimum rate of $7.27 an hour in 1974, according to a survey of 69 large cities. This average was about two-thirds more than the average for nonsupervisory workers in all private industries, except farming.

Photoengravers stand up much of the time, but the work is not strenuous. Work areas usually are air-conditioned and well-lighted. Most photoengravers are members of the Graphic Arts International Union.

Sources of Additional Information

Details about apprenticeship and other training opportunities may be obtained from local employers, such as newspapers and printing shops, the local office of the union mentioned above, or the local office of the State employment service.

For general information on photoengravers, write to:

American Newspaper Publishers Association, 11600 Sunrise Valley Dr., Reston, Va. 20041.

American Photoplatemakers Association, 166 W. Van Buren St., Chicago, Ill. 60604.

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213

Graphic Arts International Union, 1900 L St. NW., Washington, D.C. 20036.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

PRINTING PRESS OPERATORS AND ASSISTANTS

(D.O.T. 651.782, .885, and .886)

Nature of the Work

Printing operations are performed in a pressroom. Printing press operators prepare type forms and press plates for final printing and tend the presses.

The object of preparation work is to insure printing impressions that are distinct and uniform. This operation may be performed by placing pieces of paper exactly the right thickness underneath low areas of the press plates to level them. Press operators also adjust control margins and the flow of ink to the inking roller. In some shops, they oil and clean the presses and make minor repairs. Press operators who work with large presses have assistants and helpers.

Press operator's jobs may differ from one shop to another, mainly because of differences in the kinds and sizes of presses. Press operators in small commercial shops generally operate relatively simple manual presses. On the other hand, a crew of several operators and less skilled workers run giant presses used by the large newspaper, magazine, and book printers. These presses are fed paper in big rolls called "webs" up to 50 inches or more in width. They print the paper on both sides; cut, assemble, and fold the pages; and count the finished newspaper sections as they come off the press.

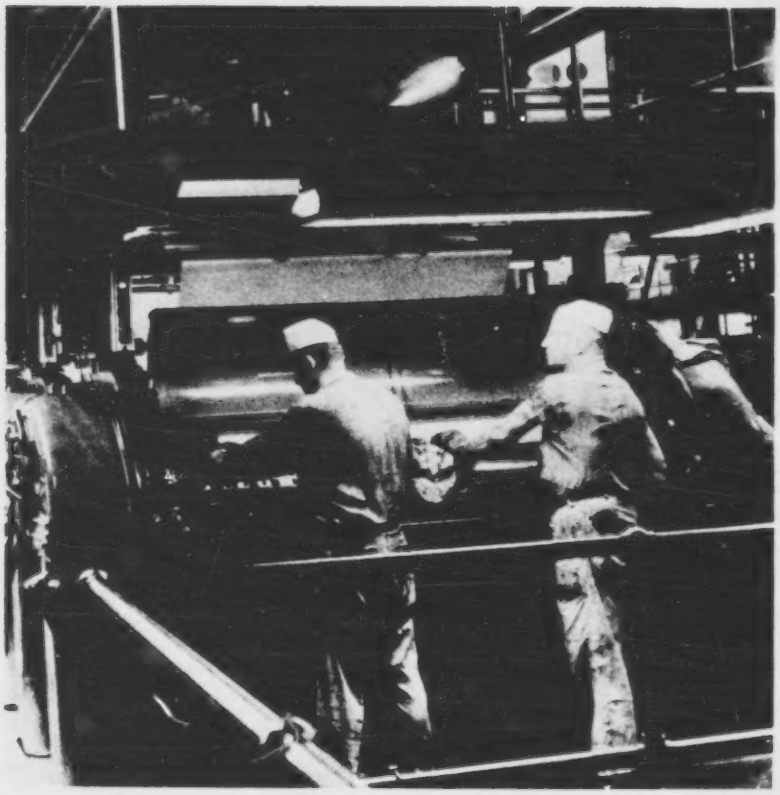
Places of Employment

About 140,000 press operators and assistants were employed in 1974. More than half work for commercial printing shops and book and magazine publishers. Many others have jobs in newspaper plants. Some press operators and assistants work for banks, insurance companies, manufacturers, and other organizations that do their own printing, such as Federal, State, and local goverments.

Press operators and assistants can find jobs throughout the country, but employment is concentrated in large cities.

Training and Other Qualifications

Most press operators learn their trade through apprenticeship, but some workers learn as helpers or press assistants. Others obtain their skills through a combination of



Press operators cleaning and oiling presses.

work experience and vocational or technical school training.

The length of apprenticeship and the content of training depend largely on the kind of press used in the plant. The apprenticeship period in commercial shops is 2 years for press assistants, and 4 to 5 years for press operators. In addition to on-the-job instruction, the apprenticeship includes related classroom or correspondence school courses.

A high school or vocational school education or its equivalent generally is required for apprenticeship. Courses in printing provide a good background. Because of technical developments in the printing industry, courses in chemistry and physics also are helpful. Mechanical aptitude is important in making press adjustments and repairs. An ability to visualize color is essential for work on color presses. Physical strength and endurance are needed for work on some kinds of presses, where operators lift heavy plates and stand for long periods.

Since there are generally long waiting lists for apprenticeship programs, it is very difficult for a high school graduate to obtain an apprenticeship right out of school. Most people have to take a job as a press assistant or an an unskilled laborer before being selected for an apprenticeship. It is not uncommon for a person to work 2 or 3 years before beginning apprenticeship training.

Employment Outlook

Employment of press operators is expected to increase about as fast as the average for all occupations through the mid-1980's. Despite the increased use of faster and more efficient presses, more press operators will be needed because of the growth in the amount of printed materials.

In addition to the jobs from employment growth, a few thousand openings will arise each year as experienced workers retire, die, or change occupations. Since more firms are using web-offset presses, the outlook for web-press operators will be particularly good.

Although most job opportunities will continue to be in the printing industry, a growing number of openings will be found in other industries, such as papermills, which are doing more of their own presswork instead of contracting it to printing firms.

Earnings and Working Conditions

A survey of union wages in 69 large cities, shows that in 1974 the average minimum hourly rate for newspaper press operators-in-charge was $7.33; for newspaper press operators, $6.74; for book and job cylinder press operators, $6.73; and for book and job press assistants and feeders, $6.63. These rates were higher than the average for all nonsupervisory workers in private industries, except farming. Many press operators work night shifts and receive extra pay.

Pressrooms are noisy, and workers in certain areas frequently wear ear protectors. Press operators are subject to hazards when working near machinery. At times, they work under pressure to meet deadlines.

Most pressroom workers are covered by union agreements. The principal union in this field is the International Printing and Graphic Communications's Union.

Sources of Additional Information

Details about apprenticeship and other training opportunities may be obtained from local employers, such as newspapers and printing shops, the local office of the union mentioned above, or the local office of the State employment service.

For general information about press operators and assistants, write to:

American Newspaper Publishers Association, 11600 Sunrise Valley Dr., Reston, Va. 20041.

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

International Printing and Graphic Communications Union, 1730 Rhode Island Ave. NW., Washington, D.C. 20036.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

OTHER INDUSTRIAL PRODUCTION AND RELATED OCCUPATIONS

ASSEMBLERS

Nature of the Work

Television sets, automobiles, and refrigerators are typical of the manufactured products that undergo many assembly operations. Assemblers put together the parts for these and thousands of other products.

Many assemblers work on items that move automatically past their work stations on conveyors. In the automobile industry one assembler may start nuts on bolts, and the next worker may tighten the nuts with power-driven tools. These assemblers must complete their job within the time it takes the part or product to pass their work station. Others, known as bench assemblers, put together small parts to make subassemblies or small complete units. In a rifle manufacturing plant a gun assembler builds an entire rifle from a collection of parts and subassemblies, and tests the moving parts to make sure they function correctly. Some assemblers, known as floor assemblers, put together large, heavy machinery or equipment on shop floors, often fastening parts with bolts, screws, or rivets.

Assemblers use many different tools depending on the product and the work they are doing. Pliers, screwdrivers, soldering irons, power drills, and wrenches are among the common tools used.

Skilled assemblers work on the more complex parts of subassemblies with little or no supervision, and are responsible for the final assembly of complicated jobs. Some work with engineers and technicians, assembling products that these people have just designed. These workers must know how to read blueprints and other engineering specifications and use a variety of tools and precision measuring instruments.

Places of Employment

About 1,140,000 assemblers worked in manufacturing plants in 1974. Almost two-thirds were in plants that made machinery and motor vehicles. More than half of all assemblers were employed in the heavily industrialized States of California, New York, Michigan, Illinois, Ohio, and Pennsylvania.

Training, Other Qualifications, and Advancement

Inexperienced people can be trained to do assembly work in a few days or weeks. New workers may have their job duties explained to them by the supervisor and then be placed under the direction of experienced employees. When new workers have developed sufficient speed and skill, they are placed 'on their own" and are responsible for the work they do.

Employers seek applicants who are physically fit and who can do routine work at a fast pace. A high school diploma usually is not required.

For some types of assembly jobs, applicants may have to meet special requirements. Some employers look for applicants with mechanical aptitude and prefer those who have taken vocational school courses such as machine shop. Good eyesight, with or without glasses, may be required if the assemblers work with small parts. In plants that make electrical and electronic products, which may contain many different colored wires, applicants often are tested for color blindness.

As assemblers become more experienced they may progress to assembly jobs that require more skill. A few advance to skilled assembly jobs. Experienced assemblers who have learned many assembly operations and thus understand the construction of a product may become product repairers. These workers fix assembled articles which inspectors have ruled defective. Assemblers may also advance to inspector and a few are promoted to supervisor. Some assemblers become trainees in skilled trades jobs such as machinist.

Employment Outlook

Employment of assemblers is expected to increase about as fast as the average for all occupations through the mid-1980's, with thousands of openings each year. Many job openings will also result as workers retire, die, or transfer to other occupations.

Manufacturing plants will need more assemblers to produce goods for the Nations's growing economy. Growth in population and personal income will increase the demand for consumer products such as automobiles and household appliances while business expansion will increase the demand for industrial machinery and equipment.

Most assemblers work in plants that produce durable goods, such as automobiles and aircraft, which are particularly sensitive to changes in business conditions and national defense needs. Therefore, even though employment is expected to grow, jobseekers may find opportunities scarce in some years.

Earnings and Working Conditions

Wage rates for assemblers ranged from about $2 to $6 an hour in 1974, according to information from a limited number of union contracts. Most assemblers covered by these contracts made between $3 and $5.50 an hour. Some assemblers are paid incentive or piecework rates and are encouraged to work more rapidly by the prospect of higher earnings.

The working conditions of assemblers differ, depending on the particular job performed. Assemblers of electronic equipment may put together small components at a bench in a room that is clean, well lighted, and free from dust. Floor assemblers of industrial machinery, on the other hand, may install and assemble heavy parts and be exposed to contact with oil and grease. Workers on assembly lines may be under pressure to keep up with the speed of the lines. Since most assemblers only perform a few steps in the assembly operation, assembly jobs tend to be more monotonous than other blue-collar jobs.

Many assemblers are members of labor unions. These include the International Association of Machinists and Aerospace Workers; the International Union of Electrical, Radio and Machine Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; and the International Brotherhood of Electrical Workers.

Source of Additional Information

Additional information about employment opportunities for assemblers may be available from local offices of the State employment service.

Some assemblers do delicate work.

AUTOMOBILE PAINTERS

(D.O.T. 845.781)

Nature of the Work

Automobile painters make old and damaged motor vehicles "look like new." These skilled workers repaint vehicles that have lost the luster of their original paint, and the repaired portions of damaged vehicles. (Production painters who work for motor vehicle manufacturers are discussed elsewhere in the *Handbook*.)

To prepare an automobile for painting, painters or their helpers rough-sand it to remove original paint and rust. Painters then use a spray gun to apply primer coats to the automobile surface. After the primer dries, they sand the surface until it is smooth. For roughsanding, they usually use a pneumatic or electric sander and a coarse grade of sandpaper; final sanding may be done by hand, using a fine grade of sandpaper. Small nicks and scratches that cannot be removed by sanding are filled with automobile body putty. Masking tape and paper are used to cover areas not to be painted.

Before painting repaired portions of an automobile, painters may mix paints to match the color of the car.

Auto painter prepares car for spray painting.

Before applying paint, they adjust the nozzle of the spray gun according to the kind of lacquer or enamel being used and, if necessary, adjust the air-pressure regulator to obtain the correct pressure. To speed drying, they may place the freshly painted automobile under heat lamps or in a special infrared oven. Painters or their helpers may polish the newly painted surface.

Places of Employment

About 25,000 persons worked as automobile painters in 1974. Almost two-thirds worked in shops that specialize in automobile repairs. Most others worked for automobile and truck dealers. Some painters worked for organizations that maintained and repaired their own fleets of motor vehicles, such as trucking companies and buslines.

Painters are employed throughout the county and are concentrated in metropolitan areas.

Training, Other Qualifications, and Advancement

Most automobile painters begin their careers as helpers, and acquire their skills informally by working with experienced painters. Usually, helpers remove automobile trim, clean and sand surfaces to be painted, and polish newly painted surfaces. As helpers gain experience, they progress to more complicated tasks, such as using spray guns to apply primer coats and paint small areas. To become a fully qualified painter, 3 to 4 years of on-the-job training usually are required.

A small number of automobile painters learn through apprenticeship. Apprenticeship programs, which generally last 3 years, consist of on-the-job training supplemented by classroom instruction.

Young persons considering this work as a career should have good health, keen eyesight, and a good color sense. Courses in automobile-body repair offered by high schools and vocational schools provide helpful experience. Completion of high school is generally not a requirement but may be an advantage, because to many employers high school graduation indicates that a young person can complete a job.

An experienced automobile painter with supervisory ability may advance to shop supervisor. Many experienced painters with the necessary funds open their own shops.

Employment Outlook

Employment of automobile painters is expected to increase about as fast as the average for all occupations through the mid-1980's. In addition to jobs created by growth, several hundred openings are expected each year because of the need to replace experienced painters who retire or die. Openings also will occur as some painters transfer to other occupations.

Employment of automobile painters is expected to increase primarily because more motor vehicles will be damaged in traffic accidents as the number of vehicles grows. Accident losses will grow, even though better highways, lower speed limits, driver training courses, and improved bumpers and other safety features on new vehicles may slow the rate of growth.

Most persons who enter the occupation can expect steady work as the automobile repair business is not very vulnerable to changes in economic conditions.

Job opportunities will be best in metropolitan areas. Many shops in small cities do not have enough business to hire trainees.

Earnings and Working Conditions

Painters employed by automobile dealers in 34 large cities had estimated average hourly earnings of $7.60 in 1974, compared with $4.05, the average for all nonsupervisory workers in private industry, except farming. Skilled painters usually earn between two and three times as much as inexperienced helpers and trainees.

Many painters employed by automobile dealers and independent repair shops receive a commission based on the labor cost charged to the customer. Under this method, earnings depend largely on the amount of work and how fast the painter completes it. Employers frequently guarantee their commissioned painters a minimum weekly salary. Helpers and trainees usually are paid an hourly rate until they become sufficiently skilled to work on a commission basis. Painters employed by trucking companies, buslines, and other organizations that repair their own vehicles usually receive an hourly rate. Most painters work 40 to 48 hours a week.

Automobile painters are exposed to fumes from paint and paintmixing ingredients. However, in most shops, the painting is done in special ventilated booths that protect the painters. Masks covering the nose and mouth are used, also. Painters must be agile because they often bend and stoop while working. Many automobile painters belong to unions, including the Inter-

national Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Most painters who are union members work for the larger automobile dealers, trucking companies, and buslines.

Sources of Additional Information

For more details about work opportunities, contact local employers, such as automobile-body repair shops and automobile dealers; locals of the unions previously mentioned; or the local office of the State employment service. The State employment service also may be a source of information about apprenticeship and other programs that provide training opportunities.

For general information about the work of automobile painters, write:

Automotive Service Industry Association, 230 North Michigan Ave., Chicago, Ill. 60601

Automotive Service Councils of America, Inc., 4001 Warren Blvd., Hillside, Ill. 60162

BLACKSMITHS

(D.O.T. 356.381 and 610.381)

Nature of the Work

Years ago the village blacksmith was as vital as the country doctor. No one else could repair a broken wagon wheel, shoe a horse, or forge a tool to suit a farmer's needs. Power hammers and ready-made horseshoes have made work easier,

but the blacksmith's job has remained basically the same.

To make or repair metal parts, blacksmiths first heat the metal in a forge to soften it. When the metal begins to glow, they pick it up with tongs, place it on the anvil, and shape it with presses and power hammers. Broken parts are rejoined by hammering them together. The blacksmith uses handtools such as hammers and chisels to finish the part, often reheating it in the forge to keep it soft and workable.

To harden a finished part, blacksmiths heat it to a high temperature in the forge and then plunge it into a water or oil bath. To temper the part—make it less brittle—they heat the metal to a lower temperature for some time, and then allow it to cool at room temperature.

Industrial occupations which are similar to blacksmith include forge and hammer operator, welder, and boilermaker. (These occupations are discussed elsewhere in the *Handbook*.)

Blacksmiths who specialize in shoeing horses are called farriers. After removing the old shoe with nail snippers and pincers, farriers examine the horse's hoof for bruises and clean, trim, and shape the hoof. When the hoof is ready they position and nail a shoe on the hoof and trim the hoof flush to the new shoe. Today most farriers use ready-made horseshoes, but they may have to make or adjust shoes for a proper fit.

Places of Employment

Of the nearly 9,000 blacksmiths employed in 1974, almost two-thirds worked in factories, railroads, and mines. The remainder

worked in small shops, and most were self-employed. Blacksmiths work in all parts of the country—in rural communities as well as in large industrial centers.

Training, Other Qualifications, and Advancement

Many beginners enter the occupation by working as helpers in blacksmith shops or large industrial firms which employ blacksmiths. Others enter through formal apprenticeship programs and from related occupations such as forge operator or hammer operator. Apprenticeship programs usually last 3 or 4 years. The programs teach blueprint reading, proper use of tools and equipment, heat-treatment of metal, and forging methods. Most apprentices are found in large industrial firms rather than in small repair shops. Vocational school or high school courses in metalworking, and blueprint reading are helpful to young people interested in becoming blacksmiths.

Courses in horseshoeing are available at several schools. The Cornell University School of Veterinary Medicine in Ithaca, N.Y., offers a 16-week (640-hour) course, and shorter courses are offered by Pennsylvania State University at State College, the University of Maine at Orono, and Oklahoma Horseshoeing School at Stillwater.

Blacksmiths must be in good physical condition. Pounding metal and handling heavy tools and parts require considerable strength and stamina.

Opportunities for advancement are limited, especially for blacksmiths who work in small repair shops. However, blacksmiths may advance to be supervisors or inspectors in factories, or to open their own repair shops. Blacksmiths also may be able to transfer to related occupations such as forge, hammer, and press operator.

Employment Outlook

Employment of blacksmiths is expected to decline through the mid-1980's. Forge shops are using machines to produce many of the metal articles that were formerly handmade by blacksmiths. In addition, welders are doing much of the metal repair work once done by blacksmiths. Nevertheless, some job openings will occur as experienced blacksmiths retire, die, or transfer to other occupations.

Employment of farriers may increase slightly due to the growing popularity of horses for recreation. Since this is a small occupation, however, relatively few job openings will become available.

Earnings and Working Conditions

In union contracts covering a number of blacksmiths in steel plants, railroad shops, and in the shipbuilding and petroleum industries, hourly pay ranged from $4 to $7.50 in 1974.

Blacksmith shops tend to be hot and noisy, but conditions have improved in recent years because of large ventilating fans and less vibration from new machines. Blacksmiths are subject to burns from forges and heated metals and cuts and bruises from handling tools. Safety glasses, metal-tip shoes, face shields, and other protective devices have helped to reduce injuries.

Many blacksmiths are members of the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers. Other unions representing blacksmiths include the United Steelworkers of America, the Industrial Union of Marine and Shipbuilding Workers of America, and the International Union of Journeymen Horseshoers.

Sources of Additional Information

For details about training opportunities in this trade, contact local blacksmith shops and local offices of the State employment service.

BLUE-COLLAR WORKER SUPERVISORS

Nature of the Work

In any organization, someone has to be boss. For the millions of workers who assemble television sets, service automobiles, lay bricks, unload ships, or perform any of thousands of other activities, a blue-collar worker supervisor is the boss. These supervisors direct the activities of other employees and frequently are responsible for seeing that millions of dollars worth of equipment and materials are used efficiently. While blue-collar worker supervisors are most commonly known as foremen or forewomen, they also have many other titles. In the textile industry they are referred to as second hands; on ships they are known as boatswains; and in the construction industry they are often called overseers, straw bosses, or gang leaders.

Although their titles differ between industries, the job of all blue-collar worker supervisors is similar. They tell other employees what jobs are to be done and make sure the jobs are done correctly. For example, loading supervisors at truck terminals assign workers to load trucks and check that the material is loaded correctly. In some cases, supervisors also do the same work as other employees. This is especially true in the construction industry where, for example, bricklayer supervisors also lay brick.

Because they are responsible for the output of other workers, supervisors make work schedules and keep production and employee records. They use considerable judgment in planning and must allow for unforeseen problems such

Blue-collar worker supervisor checks production records.

as absent workers and machine breakdowns. Teaching employees safe work habits and enforcing safety rules and regulations are other supervisory responsibilities. They also may train new employees.

In addition to their other duties, blue-collar worker supervisors tell their subordinates about company plans and policies, reward good workers by making recommendations for wage increases, awards, or promotions, and deal with poor workers by issuing warnings or recommending that they be fired or laid off without pay for a day or more. In companies where employees belong to labor unions, supervisors may meet with union representatives to discuss work problems and grievances. They must know the provisions of labor-management contracts and run their operations according to these agreements.

Places of Employment

About 1,460,000 blue-collar worker supervisors were employed in 1974. Although they work for almost all businesses and government agencies, over half work in manufacturing, supervising the production of cars, washing machines, or any of thousands of other products. Most of the rest work in the construction industry and in wholesale and retail trade. Because employment is distributed in much the same way as population, jobs are located in all cities and towns.

Training, Other Qualifications, and Advancement

When choosing supervisors, employers generally look for experience, skill, and leadership qualities. Employers place special emphasis on the ability to motivate employees, command respect, and get along with people. Completion of high school is often the minimum educational requirement, and 1 or 2 years of college or technical school can be very helpful to workers who want to become supervisors.

Most supervisors rise through the ranks—that is, they are promoted from jobs where they operated a machine, or worked on an assembly line, or at a construction craft. This work experience gives them the advantage of knowing how jobs should be done and what problems may arise. It also provides them with insight into management policies and employee attitudes towards these policies. Supervisors are sometimes former union representatives who are familiar with grievance procedures and union contracts. To supplement this work experience, larger companies usually have training programs to help supervisors make management decisions. Smaller companies often use independent training organizations or written training materials.

Although fewer than one-tenth of all blue-collar worker supervisors are college graduates, a growing number of employers are hiring trainees with a college or technical school background. This practice is most prevalent in industries with highly technical production processes, such as the chemical, oil, and electronics industries. Employers generally prefer backgrounds in business administration, industrial relations, mathematics, engineering, or science. The trainees undergo on-the-job train-

ing until they are able to accept supervisory responsibilities.

Supervisors with outstanding ability, particularly those with college education, may move up to higher management positions. In manufacturing, for example, they may advance to jobs such as department head and plant manager. Some supervisors, particularly in the construction industry, use the experience and skills they gain to go into business for themselves.

Employment Outlook

Employment of blue-collar worker supervisors is expected to increase at about the same rate as the average for all occupations through the mid-1980's. In addition, many job openings will arise as experienced supervisors retire, die, or transfer to other occupations.

Population growth and rising incomes will stimulate demand for goods such as houses, air conditioners, TV sets, and cars. As a result, more blue-collar workers will be needed to produce and sell these items, and more supervisors will be needed to direct their activities. Although most of these supervisors will continue to work in manufacturing, a large part of the increase in jobs will be due to the expansion of nonmanufacturing industries, especially in the trade and service sectors.

There is usually keen competition for supervisory jobs. Competent workers who possess leadership ability and have a few years of college are the most likely to be selected.

Earnings and Working Conditions

In 1974 average earnings of blue-collar worker supervisors who worked full time were $13,249, compared with $10,975 for workers in all occupations. Supervisors usually are salaried and are not paid for overtime. Their salaries generally are determined by the wage rates of the highest paid workers they supervise. Some companies keep wages of supervisors about 10 to 30 percent higher than those of their subordinates.

Since supervisors are responsible for the work of other employees, they generally work more than 40 hours a week and are expected to be on the job before other workers arrive and after they leave. They sometimes do paperwork at home and may find themselves worrying about job-related problems after work.

Working conditions vary from industry to industry. In factories, supervisors may get dirty around machinery and materials and have to put up with noisy factory operations.

Some supervisors who have limited authority may feel isolated, neither a member of the work force nor an important part of management. On the other hand, supervisors have more challenging and prestigious jobs than most blue-collar workers.

Sources of Additional Information

A bibliography of career literature on management occupations is available from:

American Management Association, 135 West 50th St., New York, N.Y. 10020.

BOILERMAKING OCCUPATIONS

Nature of the Work

Boilers, vats, and other large vessels that hold liquids and gases are essential to many industries. Boilers, for example, supply the steam that drives the huge turbines in electric utility plants and ships. Tanks and vats are used to process and store chemicals, oil, and hundreds of other products. Layout workers and fitters help make the parts for these vessels, and boilermakers assemble them.

Layout workers (D.O.T. 809.381 and .781) follow blueprints in marking off lines on metal plates and tubes. These lines serve as guides to other workers in the shop who cut and shape the metal. Layout workers use compasses, scales, gauges, and other devices to make measurements. Their measurements must be precise because errors may be difficult or impossible to correct once the metal is cut.

Before the boiler parts are assembled, *fitters* (D.O.T. 819.781) see that they fit together properly. These workers bolt or tackweld the parts into place temporarily and alter those that do not line up according to blueprints. To make alterations, they use drills, grinders, welding machines, cutting torches, and other tools.

Boilermakers (D.O.T. 805.281) assemble and erect large boilers in shops and at the construction sites where these vessels will be used. They lift heavy metal parts into place with rigging equipment such as hoists and jacks, and weld or rivet the parts together. After a boiler is completed, they test it for leaks and other defects.

Boilermakers also do repair jobs. After finding the cause of the trouble, they may dismantle the boiler, patch weak spots with metal stock, replace defective sections with new parts, or strengthen joints. Installation and repair work often must meet State and local safety standards.

Places of Employment

About 45,000 boilermakers, layout workers, and fitters were employed in 1974. Of these, several thousand boilermakers worked in the construction industry, mainly to assemble and erect boilers and other pressure vessels. Boilermakers also were employed in the maintenance and repair depart-

ments of iron and steel plants, petroleum refineries, railroads, shipyards, and electric powerplants. Large numbers worked in Federal Government installations, principally in Navy shipyards and Federal powerplants. Layout workers and fitters worked mainly in plants that make fire-tube and water-tube boilers, heat exchangers, heavy tanks, and similar products.

Boilermaking workers are employed throughout the country, but employment is concentrated in highly industrialized areas, such as: New York, Philadelphia, Chicago, Pittsburgh, Houston, San Francisco, and Los Angeles.

Training, Other Qualifications, and Advancement

Many people have become boilermakers by working for several years as helpers to experienced boilermakers, but most training authorities agree that a formal apprenticeship is the best way to learn this trade. Apprenticeship programs usually consist of 4 years of on-the-job training, supplemented by about 150 hours of classroom instruction each year in subjects such as blueprint reading, shop mathematics, and welding.

Most layout workers and fitters are hired as helpers and learn the craft by working with experienced employees. It generally takes at least 2 years to qualify as an experienced layout worker or fitter.

When hiring apprentices or helpers, employers prefer high school or vocational school graduates. Courses in shop, mathematics, blueprint reading, welding, and metalworking provide a useful background for all boilermaking jobs. Most firms require applicants to pass a physical examination because good health and the capacity to do heavy work are necessary in these jobs. Mechanical aptitude and manual dexterity also are important qualifications.

Layout workers and fitters may become boilermakers or advance to shop supervisors. Boilermakers may become supervisors for boiler installation contractors; a few may go into business for themselves.

Employment Outlook

Employment in boilermaking occupations is expected to increase faster than the average for all occupations through the mid-1980's. In addition to the job openings resulting from employment growth, many openings will arise each year as experienced workers retire, die, or transfer to other fields of work.

The construction of many new electric powerplants, especially nuclear plants, will create a need for additional boilers and will cause employment of boilermakers, layout workers, and fitters to increase.

The expansion of other industries which use boiler products, such as the chemical, petroleum, steel, and shipbuilding industries, will further increase the demand for these workers.

Many of the industries which purchase boilers are sensitive to economic conditions. Therefore, during economic downturns some boilermakers, fitters, and layout workers may be laid off.

Earnings and Working Conditions

According to a national survey of workers in the construction industry, union wage rates for boilermakers averaged $8.60 an hour in 1974, compared with $8.16 for all building trades.

Comparable wage data were not available for boilermakers employed in industrial plants. However, wage rates were available from union contracts that cover many boilermakers, layout workers, and fitters employed in fabricated plate work and the petroleum and shipbuilding industries in 1974. Most of these contracts called for hourly rates ranging from about $4.50 to $10. Generally, layout workers earned more than boilermakers, and boilermakers earned more than fitters.

When assembling boilers or making repairs, boilermakers often work in cramped quarters or at great heights. Some work also must be done in damp, poorly ventilated places. Boilermaking is more hazardous than many other metalworking occupations. Employers and unions attempt to eliminate injuries by promoting safety training and the use of protective equipment, such as safety glasses and metal helmets.

Most boilermaking workers belong to labor unions. The principal union is the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers. Some workers are members of the Industrial Union of Marine and Shipbuilding Workers of America; the Oil, Chemical and Atomic Workers International Union; and the United Steelworkers of America.

Sources of Additional Information

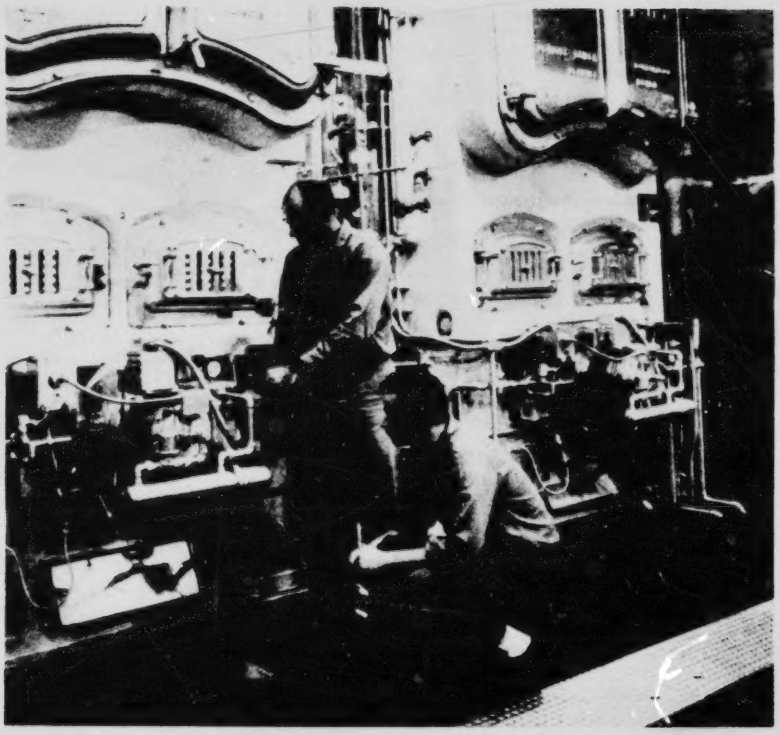
For further information regarding boilermaking apprenticeships or other training opportunities, contact local offices of the unions previously mentioned, local construction companies and boiler manufacturers, or the local office of the State employment service.

BOILER TENDERS

(D.O.T. 951.885)

Nature of the Work

Boiler tenders operate and maintain the steam boilers that power industrial machinery and heat factories, offices, and other buildings. Qualified tenders may be responsi-



Boiler tenders check meters and gages to determine if boilers are functioning properly.

ble for inspecting boiler equipment, lighting boilers, and maintaining steam pressure.

In most plants, boiler tenders operate mechanical devices that control the flow of air, gas, oil, or coal into fireboxes. They read meters and other instruments to determine if boilers are functioning safely. They sometimes make minor repairs, and test and treat boiler water with chemicals. They also may operate waste heat boilers which burn trash and other solid waste.

Boiler tenders often are supervised by stationary engineers who operate and maintain a variety of equipment, including boilers, diesel and steam engines, and refrigeration and air-conditioning systems. (Additional information on stationary engineers appears elsewhere in the *Handbook*.)

Places of Employment

About one-half of the 90,000 boiler tenders employed in 1974 worked in factories. Plants that manufacture lumber, iron and steel, paper, chemicals, and stone, clay, and glass products are among the leading employers of boiler tenders. Public utilities also employ many of these workers. Many others were employed by hospitals, schools, and Federal, State, and local governments.

Although boiler tenders are employed in all parts of the country, most work in the more heavily populated areas where large manufacturing plants are located.

Training, Other Qualifications, and Advancement

Some large cities and a few States require boiler tenders to be licensed. An applicant can obtain the knowledge and experience to pass the license examination by first working as a helper in a boiler room. Applicants for helper jobs should be in good physical condition and have mechanical aptitude and manual dexterity. High school courses in mathematics, motor mechanics, chemistry, and blueprint reading are also helpful to persons interested in becoming boiler tenders.

There are two types of boiler tenders' licenses—for low and high pressure boilers. Low pressure tenders operate boilers generally used for heating buildings. High pressure tenders operate the more powerful boilers and auxiliary boiler equipment used to power machinery in factories as well as heat large buildings. Both high and low pressure tenders, however, may operate equipment of any pressure if a stationary engineer is on duty.

Due to regional differences in licensing requirements, a boiler tender who moves from one State or city to another may have to pass an examination for a new license. However, the National Institute for Uniform Licensing of Power Engineers is currently assisting many State licensing agencies in adopting uniform licensing requirements that would eliminate this problem by establishing reciprocity of licenses.

Boiler tenders may advance to stationary engineers. To help them advance, they sometimes supplement their on-the-job training by taking courses in chemistry, physics, blueprint reading, electricity, and air-conditioning and refrigeration. Boiler tenders also may become maintenance mechanics.

Employment Outlook

Employment of boiler tenders is expected to decline through the mid-1980's as more and more new boilers are equipped with automatic controls. Nevertheless, a few

thousand openings will result each year from the need to replace experienced tenders who retire, die, or transfer to other occupations.

Earnings and Working Conditions

Boiler tenders had average hourly earnings of $4.63, according to a survey of metropolitan areas in 1973-74. This was the average for all nonsupervisory workers in private industry, except farming. The average for tenders in individual areas ranged from $3 in Greenville, S.C., to $6.31 in Detroit, Mich.

Modern boiler rooms usually are clean and well lighted. However, boiler tenders occasionally may have to work in awkward positions and be exposed to noise, heat, grease, fumes, and smoke. They also are subject to burns, falls, and injury from moving machinery. Defective boilers and auxiliary equipment may be dangerous to tenders and other persons. Modern equipment and safety procedures, however, have reduced accidents.

The principal unions organizing boiler tenders are the International Brotherhood of Firemen and Oilers and the International Union of Operating Engineers.

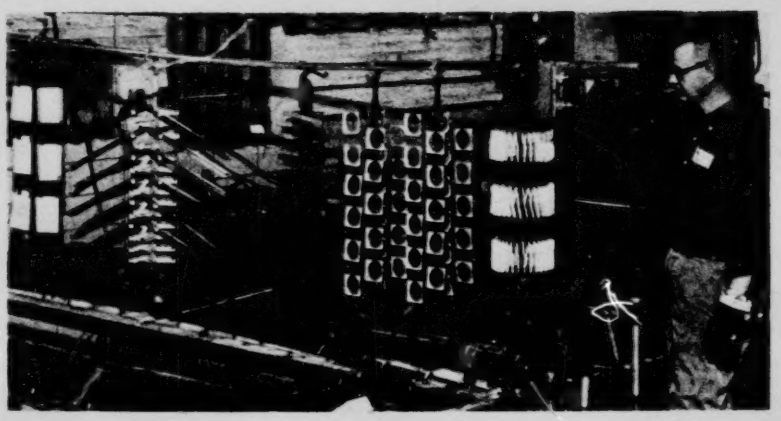
Sources of Additional Information

Information about training or work opportunities in this trade is available from local offices of State employment services, locals of the International Brotherhood of Firemen and Oilers, and from State and local licensing agencies.

Specific questions about the nature of the occupation, training, and employment opportunities may be referred to:

International Brotherhood of Firemen and Oilers, 200 Maryland Ave. NE., Washington, D.C. 20002

International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C. 20036



Electroplater prepares to immerse helicopter parts in nickel solution.

For information concerning reciprocity of boiler tenders' licenses among various cities and States, contact:

National Institute for Uniform Licensing of Power Engineers, 176 West Adam St., Suite 1911, Chicago, Ill. 60603.

ELECTROPLATERS

(D.O.T. 500.380 and .781 through .886)

Nature of the Work

Electroplaters use plating solutions and electric current (electrolysis) to coat metal and plastic articles with chromium, nickel, silver, or other metal to give the articles a protective surface or an attractive appearance. Products that are electroplated include items as widely different as automobile bumpers, silverware, costume jewelry, electronic components, and jet engine parts. Electroplaters also make items such as spray paint masks, turbine blades, and pen caps through a process known as electroforming.

Skill requirements and work performed vary by type of shop. All-round platers in small shops analyze solutions, do a great variety of plating, calculate the time and current needed for various types of plating, and perform other technical duties. They also may order chemicals and other supplies for their work. Platers in larger shops usually carry out more specialized assignments that require less extensive knowledge.

In preparing an article for electroplating, platers may first cover parts of it with lacquer, rubber, or tape to keep these parts from being exposed to the plating solution. They then either scour the article or dip it into a cleaning bath to remove dirt and grease before putting it in the solution. They may remove the article from the solution from time to time to make sure that work is progressing satisfactorily.

Electroplaters must visually inspect their work for defects such as minute pits and rodules. To determine the quality of the work, they use micrometers, calipers, and electronic devices.

Places of Employment

In 1974 about 34,000 people worked as electroplaters. About half of them worked in shops that specialized in metal plating and polishing for manufacturing firms and for other customers. The remaining platers worked in plants

that manufactured plumbing fixtures, cooking utensils, household appliances, electronic components, motor vehicles, and other metal products. Also the U.S. government employs platers in a number of military and civilian installations for maintenance purposes.

Electroplaters work in almost every part of the country, although most work in the Northeast and Midwest near the centers of the metalworking industry. Large numbers of electroplaters work in Los Angeles, San Francisco, Chicago, New York, Detroit, Cleveland, Providence, and Newark, N.J.

Training, Other Qualifications, and Advancement

Most electroplaters learn the trade on the job by helping experienced platers. It usually takes at least 3 years to become an all-round plater. Platers in large shops usually are not required to have an all-round knowledge of plating, and can learn their jobs in much less time.

A small percentage of electroplaters receive all-round training by working 3 or 4 years as an apprentice. Apprenticeship programs combine on-the-job training and related classroom instruction in the properties of metals, chemistry, and electricity as applied to plating. Apprentices do progressively more difficult work as their skill and knowledge increase. By the third or fourth year, they determine cleaning methods, do plating without supervision, make solutions, examine plating results, and direct helpers. Qualified platers may become supervisors. Some electroplaters become sales representatives for metal products wholesalers or manufacturers.

A few people take a 1- or 2-year electroplating course in a junior college, technical institute, or vocational high school. In addition, many branches of the American Electroplaters Society give basic courses in electroplating. Young persons who wish to become electroplaters will find high school or vocational school courses in chemistry, electricity, physics, mathematics, and blueprint reading helpful.

Employment Outlook

Employment of electroplaters is expected to grow about as fast as the average for all occupations through the mid-1980's. In addition, many openings will result from the need to replace experienced workers who retire, die, or transfer to other occupations.

Expansion of metalworking industries and the electroplating of a broadening group of metals and plastics are expected to increase the need for electroplaters. However, employment growth will be somewhat restricted by mechanization and the use of more efficient plating methods.

Earnings and Working Conditions

Hourly wage rates for electroplaters ranged from $2.50 to $5.25 in 1974, according to the limited information available. During apprenticeship or on-the-job training, a worker's wage rate starts at about 60 to 70 percent of an experienced worker's rate and progresses to the full rate by the end of the training period.

Plating work involves some hazards because acid, alkaline, and poisonous solutions are used. Humidity and odor also are problems in electroplating plants. However, most plants have ventilation systems and other safety devices that have reduced occupational hazards. Protective clothing and boots provide additional protection. Generally, mechanical devices are used for lifting, but at times the worker must lift and carry objects weighing up to 100 pounds.

Some platers are members of the Metal Polishers, Buffers, Platers and Helpers International Union. Other platers have been organized by the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America, and the International Association of Machinists and Aerospace Workers.

Sources of Additional Information

For additional information about job opportunities and training, write to:

American Electroplaters Society, Inc., 56 Melmore Gardens, East Orange, N.J. 07017.

National Association of Metal Finishers, 248 Lorraine Ave., Upper Montclair, N.J. 07043.

FORGE SHOP OCCUPATIONS

Forging is one of the oldest methods of working and shaping metals. The simplest way is the hand forging done by a blacksmith. Modern forge shops substitute heavy power equipment and dies (tools that shape metal) for the blacksmith's hammer and anvil. Five employees operating a large forging machine can turn out more forgings in 1 hour than five blacksmiths can make in a year.

Forged metal is exceptionally strong and is used for many products that must withstand heavy wear. Examples include automobile crankshafts, gears, wrenches, and many aerospace equipment parts. Most forgings are steel; but aluminum, copper, brass, bronze, and other metals are forged also. Forgings vary in weight from ounces to many tons.

Nature of the Work

Before metal can be shaped, it must be heated in intensely hot furnaces (forges). Then workers manipulate the glowing metal

between two metal dies that are attached to power presses or hammers. With tremendous force, the hammers or presses pound or squeeze the metal into the desired shape. To finish the forging, other workers remove rough edges and excess metal and perform other finishing operations such as heat treating and polishing.

Two kinds of dies are used. The open die, which is flat and similar to the blacksmith's hammer, is used when only a limited quantity of forgings or large-size forgings are needed. The impression, or closed die, which has a cavity shaped to the form of the metal part, is used to produce large quantities of identical forgings.

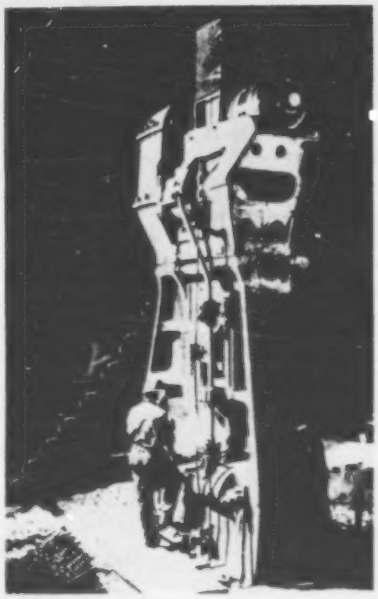
Basic forge-shop equipment consists of various types of power hammers, power presses, dies, and furnaces. Forge-shop workers also use handtools, such as hammers and tongs, and measuring devices, such as rules, scales, and calipers.

Descriptions of some major forge-shop production occupations follow.

Hammersmiths (D.O.T. 612.381) direct the operation of open die power hammers. They interpret blueprints, drawings, and sketches so that the part being forged will meet specifications. They decide the amount of hammer force and if and when the metal needs additional heating. Hammersmiths determine how to work the metal under the hammer and which tools are needed to produce desired angles and curves.

Hammersmiths head crews of four or more workers. A hammer driver or hammer runner regulates the force of the forging blow. A crane operator transfers the metal from the furnace to the hammer and manipulates it under the hammer. A heater controls the furnace that brings the metal to correct temperatures. One or more helpers assist the crew as needed.

The duties of *hammer operators* (D.O.T. 610.782), who operate impression die power hammers, are similar to those of hammersmiths at open die power hammers. Generally, the bigger the hammer and the larger or more intricate the shape to be formed, the greater the skill required of the operator. With the assistance of helpers and heaters, hammer operators set and align dies in the hammers. They control the force of the forging blow, manipulate the metal under the hammer, and determine if and when the metal needs additional heating.



Hammer operator shapes metal parts with large power hammer.

Press operators (D.O.T. 611.782 and .885) control huge presses equipped with either impression or open dies that press and squeeze hot metal rather than hammer or pound it. They regulate machine pressure and move the hot metal between the dies. They also may control the metal heating operations. Some operators set up the dies in the presses. Their skills are very similar to those of hammersmiths or hammer operators.

With the help of heaters and several helpers, *upsetters* (D.O.T. 611.782) operate machines that shape hot metal by applying horizontal pressure. The heads of nails and bolts, for example, are made by upset forging.

Heaters (D.O.T. 619.782) control furnace temperatures. They determine when the correct temperature has been reached by observing the metal's color and the furnace's temperature gauge. Using tongs or mechanical equipment, they transfer the hot metal from the furnace to hammers or presses. Some heaters clean furnaces.

Inspectors (D.O.T. 612.281) examine forged pieces for accuracy, size, and quality. They use gauges, micrometers, and calipers to measure forgings. Machines that test strength and hardness and electronic testing devices also may be used.

Die sinkers (D.O.T. 601.280) make the impression dies for the forging hammers and presses. Working from a blueprint, drawing, or template, these skilled workers make an outline of the object to be forged on two matching steel blocks. They form the object's shape in the blocks by using milling machines and other machine tools such as EDM (electrical discharge machinery) and ECM (electrical chemical machinery). Using scrapers, grinders, and other handtools, die sinkers smooth and finish the die cavity. Finally, a sample is prepared from the finished cavity and is checked against specifications.

Many forge-shop workers clean and finish forgings. For example, *trimmers* (D.O.T. 617.885) remove excess metal with presses equipped with trimming dies. *Grinders* (D.O.T. 705.884) remove rough edges with power abrasive wheels. *Sandblasters* or *shotblasters* (D.O.T. 503.887) operate sandblasting or shotblasting equipment that cleans and smoothes forgings. *Picklers* (D.O.T. 503.885) dip forgings in an acid solution to remove surface scale and reveal any surface de-

fects. *Heat treaters* (D.O.T. 504.782) heat and cool forgings to harden and temper the metal.

Places of Employment

In 1974, about 65,000 production workers were employed in forge shops. About three-fourths of these worked in shops that make and sell forgings. The remainder worked in plants that use forgings in their final products, such as plants operated by manufacturers of automobiles, farm equipment, and handtools.

Although forge-shop workers are found in all areas, they are concentrated near steel-producing centers that provide the steel for forgings, and near metalworking plants that are the major users of forged products. Large numbers of forge-shop workers are employed in and around the cities of Detroit, Chicago, Cleveland, Los Angeles, and Pittsburgh.

Training, Other Qualifications, and Advancement

Most forge-shop workers learn their skills on the job. They generally join hammer or press crews as helpers or heaters. As they become experienced, they progress to other jobs. Advancement to hammersmith, for example, requires several years of on-the-job training and experience.

Some forge shops offer apprentice training programs for skilled jobs such as diesinker, heat treater, hammer operator, hammersmith, and press operator. Apprenticeships usually last 4 years. These programs provide classroom training and practical experience in metal properties, power hammer and furnace operation, hand tool use, and blueprint reading.

Training requirements for inspectors vary. Only a few weeks of on-the-job training are necessary for those who make examinations visually or with simple gauges. Others who inspect forgings made to exact specifications may need some background in blueprint reading and mathematics, and may be given several months of training.

Employers usually require no more than a grammar school education for helpers and heaters, but high school graduates are preferred. Young people interested in more skilled forge-shop jobs should complete high school and take mathematics (especially geometry), drafting, and shopwork.

Although cranes are used to move very large objects, forge-shop workers must be strong enough to lift and move heavy forgings and dies. They need stamina and endurance to work in the heat and noise of a forge shop.

Employment Outlook

Employment of forge-shop production workers is expected to increase more slowly than the average for all occupations through the mid-1980's. Some new jobs will become available because of growth, but most openings will arise from the need to replace experienced workers who retire, die, or transfer to other fields of work.

Employment will grow because of expansion in industries that use forgings, particularly automobile and energy-related industries. The rapid expansion of nuclear power-plant construction will cause a great demand for forged piping and fittings. Likewise, many forged drilling bits and other forged products will be needed for oil drilling and coal mining operations. However, employment will not keep pace with forge shop production, because improved forging techniques and equipment will result in greater output per worker.

Employment in some forge shops is sensitive to changes in economic conditions. In shops that make automobile parts, for example, employment fluctuates with changes in the demand for new cars; thus, jobs in these shops may be plentiful in some years, scarce in others.

Earnings and Working Conditions

Average hourly earnings of forge-shop production workers are higher than the average for all manufacturing production workers. In 1974, production workers in iron- and steel-forging plants averaged $5.81 an hour, compared with $4.40 an hour for production workers in all manufacturing industries.

Many forge shops have heat deflectors and ventilating fans to reduce heat and smoke. Improvements in machinery and shop practices have reduced some noise and vibration. Forge-shop occupations are more hazardous than most manufacturing occupations. Thus, labor and management cooperate to encourage good work practices through safety training and the required use of protective equipment such as face shields, ear plugs, safety glasses, metal-toe shoes, helmets, and machine safety guards.

Most forge-shop workers are union members. Many are members of the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers. Others are members of the United Steelworkers of America; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Association of Machinists and Aerospace Workers; and the International Die Sinkers Conference (Ind.).

Sources of Additional Information

For information on employment opportunities in forging, contact local offices of the State employment service, personnel departments of forge shops, locals of the labor organizations listed above, or:

The Forging Industry Association, 55 Public Square, Cleveland, Ohio 44113.

The Open Die Forging Institute, 120 E. Ogden Ave., Hinsdale, Ill. 60521.

FURNITURE UPHOLSTERERS

(D.O.T. 780.381)

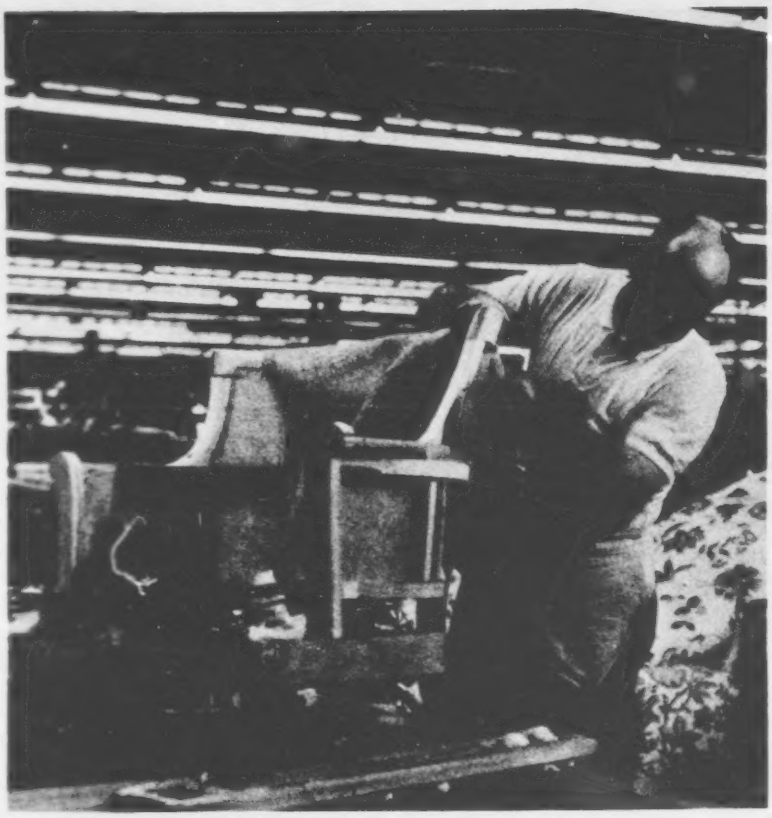
Nature of the Work

Furniture upholsterers recondition sofas, chairs, and other upholstered furniture. These craft workers repair or replace fabrics, springs, webbing, frames, and other parts that are worn or damaged. (Workers employed in the manufacture of upholstered furniture are not included in this statement.)

To work at a convenient level, upholsterers usually place the furniture on which they are working on padded wooden horses. Using tack pullers or chisels and mallets, they pull out the tacks holding the old fabric. They may then remove the padding and burlap to uncover the springs. Broken or bent springs are removed. If the webbing that holds the springs in place is worn, the workers remove all the springs and the webbing. Upholsterers then repair the frame, as well, by reglu-ing loose sections and refinishing exposed wooden parts.

In reupholstering furniture, they first tack strips of webbing to the frames. Next, they sew or staple new springs to the webbing and tie each spring to the adjoining ones, securing the outside springs to the frame. They use burlap, filling, and padding to cover the springs, and sew the padding to the burlap. Finally, after covering the padding with muslin and new upholstery fabric, they attach these materials to the frame and make sure everything is smooth and tight. They complete the job by sewing or tacking on fringe, buttons, or other ornaments.

Upholsterers use a variety of handtools including tack and staple removers, pliers, hammers, and hand or power shears. They also use special tools such as webbing stretchers and upholstery needles. They may also use sewing machines.



Upholsterer covers frame and springs with burlap.

Sometimes upholsterers pick up and deliver furniture. Those who own and manage shops order supplies and equipment, and keep business records.

Places of Employment

About 34,000 people worked as furniture upholsterers in 1974. Over half worked in small upholstery shops, most of which had from 1 to 10 employees. Many upholsterers also worked for furniture stores. A few worked for businesses such as hotels, that maintain their own furniture. Almost 1 out of every 3 upholsterers is self-employed—a much higher proportion than in most other trades.

Geographically, upholsterers are distributed in about the same proportion as population, with the highest concentration in metropolitan areas.

Training, Other Qualifications, and Advancement

The most common way to enter this trade is to start as a helper in an upholstery shop and learn on the job. Newly hired helpers remove old fabric, padding, and springs, and do other simple jobs. As they gain experience, they do more complex tasks such as installing webbing and springs, and sewing on fabric and trimming. A beginner needs about 3 years of on-the-job

training to become a skilled upholsterer.

Inexperienced persons can learn many skills of the trade by working in furniture factories and doing different jobs related to furniture upholstering. They may get valuable training, also, in vocational or high school courses that include chair caning, furniture making, textile fabrics, and upholstery repair. However, additional training and experience in a shop are usually required before these workers can qualify as skilled upholsterers. A few people learn the trade through formal apprenticeship programs that last from 3 to 4 years and include classroom instruction as well as on-the-job training.

Young persons interested in becoming upholsterers should have good manual dexterity, coordination, and be able to do occasional heavy lifting. An eye for detail, good color sense, and a flair for creative work are helpful.

Many upholsterers open their own shops.

Employment Outlook

Employment of upholsterers is expected to grow at a rate slower than the average for all occupations through the mid-1980's. Most job openings will arise because of the need to replace experienced workers who retire, die, or transfer to other occupations.

More upholstered furniture will be used as population, personal income, and business expenditures grow. But the demand for upholsterers will be limited because furniture is being constructed of fewer upholstery materials, and because more people are buying new furniture instead of having old pieces reupholstered.

Earnings and Working Conditions

Based on limited information, hourly wages for experienced furniture upholsterers ranged from $3.75 to $6 in 1974. Many self-employed upholsterers earned considerably more. Wages for inexperienced trainees ranged from $2 to $3.60 an hour.

Upholsterers usually buy handtools, but employers provide power tools.

Upholsterers generally work 40 hours a week, although overtime is common during the weeks before major holidays.

Many upholstery shops are spacious, adequately lighted, and well ventilated and heated. The workshop's air may be dusty when padding and stuffing are being cut, but precut materials have reduced this problem. Upholsterers stand while they work and also do a considerable amount of stooping and bending.

Sources of Additional Information

For more details on work opportunities for upholsterers, contact local employers or the local office of the State employment service.

INSPECTORS (MANUFACTURING)

Nature of the Work

Most products—including the things we eat, drink, wear, and ride in—are checked by inspectors sometime during the manufacturing process to make sure they are of the desired quality. Inspectors also check the quality of the raw materials and parts that make up finished goods.

Inspectors use a variety of methods to make certain that products meet specifications. They may merely look for flaws, imperfections, or defects; or they may use gauges, micrometers, and other instruments to examine parts and materials. They may read work orders or blueprints and do calculations using decimals or common fractions when measuring. They sometimes use handtools, such as screwdrivers, magnifying glasses, and tweezers.

Skilled inspectors work under general supervision, whereas semiskilled inspectors usually work under close supervision. Generally, skilled inspectors have greater discretion in accepting or rejecting products, and are responsible for inspecting the most important parts of mass-produced goods. Skilled inspectors may also use a wider variety of testing instruments.

Many inspectors count the items rejected. When the number rises above a certain level, they notify their supervisors so that corrections can be made on the production line. Some inspectors make minor repairs and adjustments and grade products for quality.

Places of Employment

About 790,000 inspectors were employed in 1974. Two-thirds worked in plants that produced durable goods such as machinery, transportation equipment, electronics equipment, and furniture. Others worked in plants that produced goods such as textiles, apparel, and leather products.

Inspectors worked in every part of the country, although they are concentrated in the industrialized States. Almost two-thirds are found in Ohio, New York, Michigan, Illinois, Pennsylvania, California, New Jersey, North Carolina, and Indiana.

Training, Other Qualifications, and Advancement

Inspectors generally are trained on the job for a brief period—from a few hours or days to several months, depending upon the skill required.

Employers look for applicants who have good health and eyesight,

Inspector checks operation of washing machines.

can follow directions, and can concentrate on details. Applicants should be able to get along with people since inspectors work occasionally as part of a team. A few large companies give preemployment tests to check such skills as the ability to work with numbers. Some employers may hire applicants who do not have a high school diploma but who have qualifying aptitudes or related experience. Other employers prefer experienced production workers for inspection jobs.

Some semiskilled inspectors—particularly in metalworking industries—who take courses, such as blueprint reading and shop mathematics, may advance to skilled inspectors or quality control technicians. After acquiring sufficient experience and knowledge, a few become supervisors.

Employment Outlook

Employment of inspectors is expected to increase faster than the average for all occupations through the mid-1980's, with thousands of openings each year. Most of the industries that employ these workers are expected to increase their output and thus employment in the longrun. The growing complexity of manufactured products should also result in a need for more inspectors. Additional openings will result as workers retire, die, or transfer to other occupations.

Inspectors seeking jobs in companies that produce durable goods, which are particularly sensitive to changes in business conditions, may find jobs scarce in some years, plentiful in others.

Earnings and Working Conditions

Wages for inspectors ranged from $2.30 to $6.30 an hour in 1974, according to information from a limited number of union contracts. Most inspectors covered by these contracts earned between $3 and $5.50 an hour.

Working conditions vary considerably for inspectors. For example, some have well lighted, air-conditioned workplaces in an aircraft or missile plant; others, who work on the production floor of a machinery or metal fabricating plant, often are exposed to high temperatures, oil, grease, and noise.

Many inspectors are members of labor unions, including the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Association of Machinists and Aerospace Workers; the International Union of Electrical, Radio and Machine Workers; and the International Brotherhood of Electrical Workers.

Sources of Additional Information

Information about employment opportunities in this field may be available from local offices of the State employment service.

The American Society for Quality Control certifies quality technicians. For information about the test required for certification, write to:

American Society for Quality Control, 161 West Wisconsin Ave., Milwaukee, Wis. 53203.

MILLWRIGHTS

(D.O.T. 638.281)

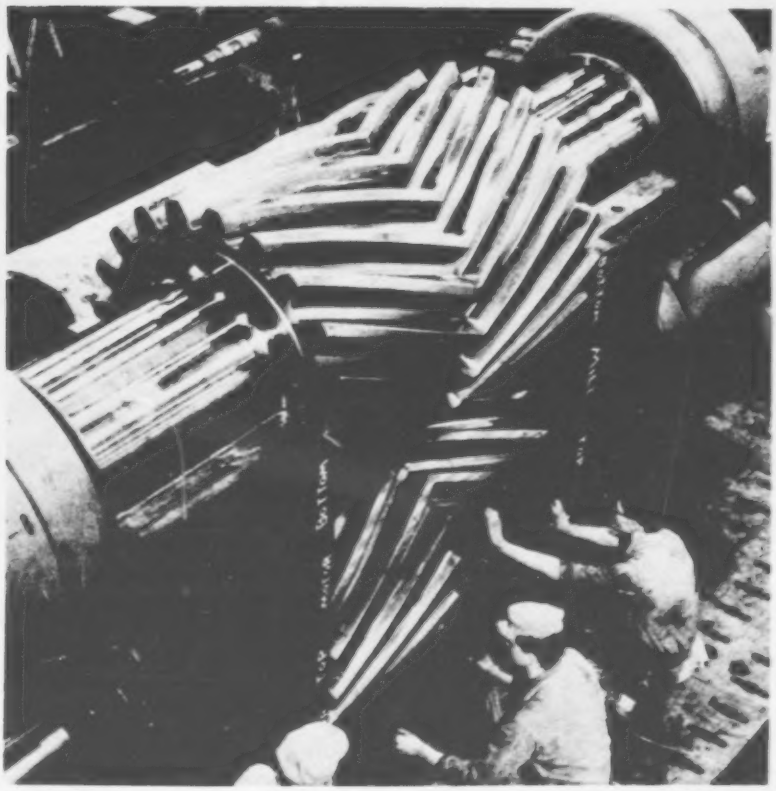
Nature of the Work

Millwrights are skilled workers who move and install heavy industrial machinery. They must know how to dismantle, reassemble, and align complex equipment. To assemble machinery, millwrights fit bearings, align gears and wheels, attach motors, and connect belts. They often construct concrete foundations and platforms and fabricate metal framework on which machinery is mounted. Millwrights must be able to read blueprints and work with wood, steel, concrete, and other building materials.

To move machinery, millwrights use hoists, jacks, wood blocking, and other rigging devices. To dismantle and assemble equipment, they use wrenches and other handtools and portable power tools. They also use calipers, squares, plumb bobs, and other devices to align and level machinery.

Millwrights employed by contract installation and construction companies do a variety of installation work. Those employed in factories usually specialize in installing the particular types of machinery used by their employers. They also may maintain plant equipment such as conveyors and cranes.

Many of the millwright's duties are also performed by industrial machinery repairers. (See statement on Industrial Machinery Repairers elsewhere in the *Handbook*.)



Millwrights work on heavy gear assembly.

Places of Employment

Most of the estimated 95,000 millwrights employed in 1974 worked for manufacturing companies; the majority were in transportation equipment, metal, paper, lumber, and chemical products industries. Others worked for contractors in the construction industry. Machinery manufacturers employed a small number to install equipment in customers' plants.

Millwrights work in every State. However, employment is concentrated in heavily industrialized areas such as Detroit, Pittsburgh, Cleveland, Buffalo, and Chicago-Gary.

Training, Other Qualifications, and Advancement

Most millwrights start as helpers to skilled workers and learn the trade on the job. Others learn through formal apprenticeship programs. Apprenticeship programs generally last 4 years and include training in dismantling, moving, erecting, and repairing machinery. Helpers also may work with concrete and receive instruction in related skills such as carpentry, welding, and sheet metal work. Classroom instruction is given in shop mathematics, blueprint reading, hydraulics, electricity, and safety.

Applicants for apprentice or helper jobs must be at least 17 years old. Many employers prefer to hire high school or vocational school graduates. Courses in science, mathematics, mechanical drawing, and machine shop practice are useful. Because millwrights often put together and take apart complicated machinery, mechanical aptitude is important. Strength and ability also are important, because the work requires considerable lifting and climbing.

Employment Outlook

Employment of millwrights is ex-

pected to increase about as fast as the average for all occupations through the mid-1980's. Employment will increase as new plants are built, as existing plant layouts are improved, and as increasingly complex machinery is installed and maintained. Besides job openings from employment growth, a few thousand openings will arise annually as experienced millwrights retire, die, or transfer to other occupations.

Earnings and Working Conditions

According to a 1973-74 survey of metropolitan areas, hourly wages for millwrights averaged $5.76—more than one-third higher than the average wage for all nonsupervisory workers in private industry, except farming. Earnings for millwrights in 11 areas that represent various regions of the country appear in the accompanying tabulation:

City	*Rate per hour, industrial millwrights (all industries)*
Akron	$6.00
Louisville	6.00
Los Angeles-Long Beach and Anaheim-Santa Ana-Garden Grove	5.92
St. Louis	5.85
Houston	5.81
Trenton	5.76
Buffalo	5.70
Minneapolis-St. Paul	5.65
New Orleans	5.16
Boston	4.63
New Haven	4.53

Millwrights employed by construction companies usually have higher wage rates than those in manufacturing. The average hourly rates for millwrights under union contracts in construction in 26 cities ranged from $6.70 to $9.77 in 1974.

Millwrights employed by factories ordinarily work year round. Millwrights employed by construction companies and those companies that manufacture and install machinery may have periods of unemployment. Frequently they work away from home.

The work of millwrights involves some hazards. For example, there are dangers of being struck by falling objects or by machinery that is being moved. There also is the danger of falling from high workplaces. In addition, millwrights are subject to usual shop hazards such as cuts and bruises. Accidents have been reduced by the use of protective devices such as safety belts and hats.

Most millwrights belong to labor unions, among which are the International Association of Machinists and Aerospace Workers; United Brotherhood of Carpenters and Joiners of America (construction millwrights); United Steelworkers of America; International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; United Paperworkers International Union; and the International Union of Electrical, Radio and Machine Workers.

Sources of Additional Information

For further information on apprenticeship programs, write to the Apprenticeship Council of the State Labor Department, local offices of State employment service, local firms employing millwrights and to:

United Brotherhood of Carpenters and Joiners of America, 101 Constitution Ave. NW., Washington, D.C. 20001.

MOTION PICTURE PROJECTIONISTS

(D.O.T. 960.382)

Nature of the Work

Projectionists are key behind-the-scenes workers in motion picture theaters. From a booth high in the back of the theater, the projectionist operates the movie projectors and sound equipment.

To show a feature-length movie, projectionists use two projectors, sound equipment, a film rewinding machine, and seven reels of film or more. Before the movie begins, they examine the film and check the equipment to see that it works properly, and load the projectors with the first and second reels. Most projectors burn a carbon rod to provide light for the screen. After igniting and adjusting the rod, projectionists start the first reel. If the picture is out of focus or unsteady, they adjust the projector lens.

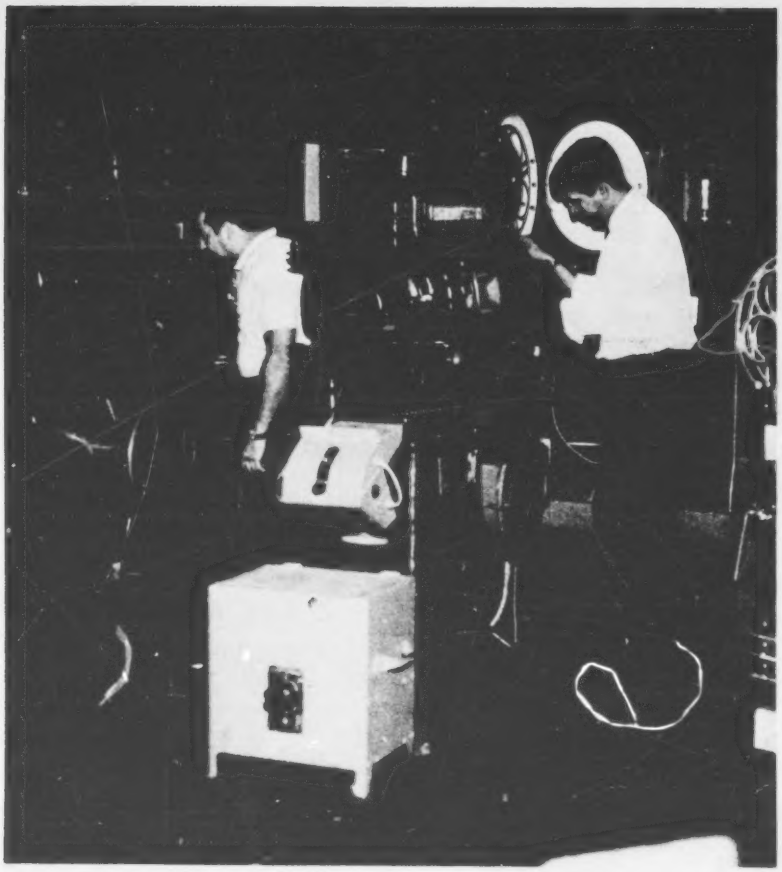
A reel of film lasts 20 minutes or more. When the reel is almost complete, cue marks (small circles in the upper right corner of the picture) signal that it is time to start the second projector. After a second series of cue marks appears, the projectionist simultaneously closes the shutter on the first projector and opens the second one. This changeover happens so quickly that the audience does not notice an interruption on the screen. Next, the projectionist removes the first reel and rewinds it on the rewinding machine. The entire process is repeated until all the reels have been shown. When film breaks, the projectionist must rapidly rethread it so that the show may continue.

Some new theaters have automatic equipment that reduces the projectionist's workload. Some machines, for example, automatically change reels.

Projectionists clean and lubricate equipment, check for defective parts and damaged film, and make minor repairs and adjustments. For example, they may replace a badly worn projector sprocket. Major repairs are made by service technicians who specialize in repairing projection and sound equipment.

Places of Employment

An estimated 18,000 motion pic-



ture projectionists were employed full time in 1974. More than three-fourths worked for indoor theaters; most of the remainder worked for drive-ins. Some projectionists worked in large manufacturing companies, television studios, and in Federal, State, and local governments.

Projectionists work in cities and towns of all sizes throughout the country. In theaters located in small towns, theater owners or members of their families may do projectionist work.

Training, Other Qualifications, and Advancement

Most theaters in urban areas are unionized and young people who want jobs as projectionists must complete a union apprenticeship program. In nonunion theaters, young people may start as ushers or helpers and learn the trade by working with an experienced projectionist.

Unions require applicants to be 18 and prefer high school graduates. The apprenticeship training usually lasts 1 to 2 years depending on the policy of the local union. After training, the apprentice must pass an exam for union membership. In some cases, a capable apprentice may be assigned to a full- or part-time job at an experienced projectionist's pay before becoming a union member. In a few cities and States, projectionists must be licensed.

Apprentices learn the trade by working with projectionists. They first learn simple tasks such as threading and rewinding film, and as they gain experience, progress to more difficult assignments, such as adjusting and repairing equipment. An apprentice may work in several theaters to become familiar with different types of equipment.

Young people interested in becoming projectionists should have good eyesight, including normal color perception, and good hearing. They should be temperamentally suited to working alone and in close quarters. Manual dexterity and mechanical aptitude also are important personal qualifications. Practical experience gained from operating small movie projectors at home, at school, or in the Armed Forces also is helpful. Advancement opportunities for projectionists are limited. Some, however, become theater managers.

In a few theaters, owners reduce costs by training apprentices to be both projectionists and managers of theaters.

Employment Outlook

Employment of motion picture projectionists is expected to grow more slowly than the average for all occupations through the mid-1980's. Most job openings will occur as experienced workers retire, die, or transfer to other fields of work. Applicants may face keen competition for the jobs that become available. Because earnings of motion picture projectionists are relatively high, applicants frequently outnumber job openings.

The number of movie theaters is expected to increase as a result of increases in population and personal income. Because of laborsaving innovations in equipment and theater design, however, employment of projectionists will not keep pace with theater growth. While older theaters required one projectionist per shift, many new ones are built side by side so that one projec-

tionist, aided by automated projection machines and longer film reels, can take care of more than one theater at a time.

Earnings and Working Conditions

Average hourly earnings for projectionists in large metropolitan areas ranged from $4.75 to $11.73 in 1974, according to information from several union contracts. Generally, downtown theaters pay higher hourly rates than suburban or drive-in theaters. Projectionists who work more than one screen usually receive extra pay.

Most projectionists work evenings; generally 4 to 6 hours, 6 evenings a week. They may work more than 6 hours on Saturday and Sunday in theaters that feature matinees. Some projectionists work at several theaters. For example, a weekly schedule may call for two evenings in each of three theaters. Projectionists employed in drive-ins, particularly in northern States, may be laid off for several months during the winter.

Projection rooms usually have adequate lighting and ventilation, and many are airconditioned. The work is not strenuous and is relatively hazard free, but there is some danger of electrical shock and burns if proper safety precautions are not taken. Although projectionists must stand a lot, they can sit for short periods while the equipment is operating. Most projectionists work without direct supervision and have infrequent contact with other theater employees.

Sources of Additional Information

Details about apprenticeship programs and employment opportunities may be obtained from any local of the International Alliance of Theatrical Stage Employees and Moving Picture Machine Operators of the United States and Canada.

OPHTHALMIC LABORATORY TECHNICIANS

(D.O.T. 711.381 and 713.884)

Nature of the Work

Ophthalmic laboratory technicians (also called *optical mechanics*) make eyeglasses prescribed by eye physicians (ophthalmologists) and optometrists.

The two types of ophthalmic laboratory technicians are surfacer (or lens grinder) and bench technician (or finisher). Starting with standard size lens blanks, which large optical firms mass-produce, surfacers lay out the work and grind and polish the lens surfaces. Surfacers use precision instruments to measure the lenses and assure that they fit the prescription. In small laboratories, one person may do these operations and benchwork too. In large laboratories, work is divided into separate operations which are performed mainly by workers who operate power grinding and polishing machines.

Bench technicians mark and cut lenses and smooth their edges to fit frames. They then assemble the lenses and frame parts into finished glasses. Bench technicians use special tools, such as lens cutters and glass drills, as well as small files, pliers, and other handtools. They also use automatic edging machines to shape lens edges, and precision instruments to detect imperfections. In large laboratories, the duties of bench technicians are divided into several operations which are performed mainly by semiskilled workers.

Places of Employment

About 22,000 persons worked as ophthalmic laboratory technicians in 1974. Most ophthalmic laboratory technicians work in ophthalmic laboratories. Some work for retail optical dispensaries or other stores that sell prescription lenses. A few work for eye physicians or optometrists who dispense glasses directly to patients.

Ophthalmic laboratory technicians are found in every State. However, employment is concentrated in large cities and in populous States.

Training, Other Qualifications, and Advancement

Most ophthalmic laboratory technicians learn their skills on the job. At first, technician trainees do simple jobs such as processing lenses through a grinding machine. As they gain experience, they progress to other operations such as lens cutting and eyeglass assembly. When the trainees have acquired experience in all types of work, which usually takes about 3 years, they are considered all-round optical mechanics. Some technicians specialize in one type of job, such as surfacing or bench work. The training time required to become a specialist is less than that needed to become an all-round technician.

High school graduates also can prepare to become a technician through 3- to 4-year formal apprenticeship programs. Apprentices with exceptional ability may complete their training in a shorter period. Most training authorities agree that technicians who learn as apprentices have more job opportunities and more opportunities for advancement than those without such training. In addition, a number of vocational schools offered 9-month full-time optical technician courses. Graduates from such schools often work for retail optical stores to receive additional on-the-job training. A small number of technicians learn their trades in the Armed Forces.

Employers prefer applicants for entry jobs as ophthalmic laboratory technicians to be high school graduates who have had courses in the

basic sciences. A knowledge of physics, algebra, geometry, and mechanical drawing is particularly valuable. The interest and ability to do precision work is essential.

Some States require licenses for ophthalmic laboratory technicians in retail optical shops. To obtain a license, the applicant generally must meet certain minimum standards of education and training, and must also pass either a written or practical examination, or both. For specific requirements, the licensing boards of individual States should be consulted.

Ophthalmic laboratory technicians can become supervisors and managers. Many of them have become dispensing opticians, although the trend is to train specifically for optician jobs. Workers in both occupations, especially those having all-round training in both shop and dispensing work, have opportunities to go into business.

Employment Outlook

Employment of ophthalmic laboratory technicians is expected to increase much faster than the average for all occupations through the mid-1980's. In addition to the job openings from employment growth, some openings will arise from the need to replace experienced workers who retire, die, or transfer to other occupations.

More technicians will be needed due to the rising demand for eyeglasses. Growth in the population, rising literacy and educational levels, and a large increase in the number of older persons (a group most likely to need glasses) will increase the demand for glasses. State programs to provide eye care for low-income families, union health insurance plans, and medicare also will stimulate demand. Moreover, the growing variety of frame styles and colors may encourages individuals to buy more than one pair of glasses.

Earnings and Working Conditions

Hourly wage rates for ophthalmic technicians ranged from $3.61 to $6.14 in 1974, based on information from a small number of union contracts.

Apprentices start at about 60 percent of the skilled worker's rate; their wages are increased periodically so that upon completion of the apprenticeship program, they receive the beginning rate for experienced workers.

Most opthalmic laboratory technicians work a 5-day, 40-hour week.

Work surroundings of the ophthalmic technician are pleasant, well-lighted, and well-ventilated, but noisy because of the power-grinding and polishing machines.

Physically handicapped persons who have full use of their eyes and hand can perform some of the more specialized jobs in the larger firms.

Some ophthalmic laboratory technicians are member of unions. The principal union in this field is the International Union of Electrical, Radio and Machine Workers (AFL-CIO).

Sources of Additional Information

A list of schools offering courses for people who wish to become ophthalmic laboratory technicians is available from:

National Academy of Opticianry, 514 Chestnut St., Big Rapids, Mich. 49307.

For general information about the occupation, contact:

International Union of Electrical, Radio and Machine Workers, 1126 16th St. NW., Washington, D.C. 20036.

Optical Wholesalers Association, 6935 Wisconsin Ave. NW., Washington, D.C. 20036.

Opticians Association of America, 1250 Connecticut Ave. NW., Washington, D.C. 20036.

PHOTOGRAPHIC LABORATORY OCCUPATIONS

(D.O.T. 970.281, 976.381, .687 through .887)

Nature of the Work

Amateur snapshots, home movies, professional portraits, and photographs to illustrate publications require the skills of thousands of photographic laboratory employees. These workers develop film, make prints and slides, and perform related tasks, such as enlarging and retouching photographs. (This chapter does not discuss employees of laboratories who specialize in processing professional motion picture film.)

All-round darkroom technicians (D.O.T. 976.381) can perform all tasks necessary to develop and print film. The technician varies the developing process according to the type of film—black-and-white negative, color negative, or color positive. For example, a developing process for black-and-white negative film covers five steps: developer, stop bath, fixing bath, washing, and drying. The first three steps use chemical solutions and are performed in darkness. After unwinding a roll of film or in the case of cut film, the technician places it in the developer, a solution that brings out the image on exposed film. When the film has remained in the developer for a specified period, the technician transfers it to a stop bath to prevent overdevelopment. Next, the film is placed in a fixing bath that makes it insensitive to light to prevent further exposure. Finally, the technician washes the film with water to remove the fixing solution and places the film in a drying cabinet. In many photographic labs, technicians regulate machines that automatically perform the steps described above.

Processes for developing color films are more complex than those

used for black-and-white. Thus, some labs employ *color technicians* (D.O.T. 976.381)—highly skilled workers who specialize in processing color film.

The darkroom technician makes a photograph by transferring the image from a negative to photographic paper. Printing frequently is performed on a projection printer, which consists of a fixture for holding negatives and photographic paper, an electric lamp, and a magnifying lens. The technician places the negative between the lamp and lens, and the paper below the lens. When the technician turns on the lamp, light passes through the negative and lens and records a magnified image of the negative on the paper. During printing, the technician may vary the contrast of the image or remove unwanted background by using paper patterns to shade part of the photographic paper from the projected image. After removing the exposed photographic paper from the printer, the technician develops it in much the same way as the negative. If the customer desires, the technician mounts the finished print in a frame or on a paper or cardboard back.

In addition to working in the laboratory, darkroom technicians may set up lights and cameras or otherwise assist experienced photographers. Many technicians, particularly those who work in portrait studios and aspire to become professional photographers, divide their time between taking and processing pictures. In some labs, helpers assist technicians. They also may be assisted by workers who specialize in a particular activity, such as *developers* (D.O.T. 976.381) *printers* (D.O.T. 976.381), and *retouchers* (D.O.T. 970.281).

In most large photo labs, darkroom technicians supervise semiskilled workers who do specialized assignments that require only a limited knowledge of developing and printing. Included are *film numberers* (D.O.T. 976.887), who sort film according to the type of processing needed and number each roll for identification; *film strippers*, who unwind rolls of film and place them in developing machines; *printer operators* (D.O.T. 976.782), who operate machines that expose rolls of photographic paper to negatives; *print developers, machine* (D.O.T. 976.885), who operate machines that develop these rolls of exposed photographic paper; *chemical mixers* (D.O.T. 976.884), who measure and combine the various chemicals that make up developing solutions; *slide mounters*, who operate machines that cut, insert, and seal slides in carboard mounts; and *photo-checkers and assemblers* (D.O.T. 976.687), who inspect the finished slides and prints and package them for customers.

Places of Employment

In 1974, about 50,000 persons worked in photo lab occupations. More than half of them were in semiskilled photofinishing occupations; the remainder were darkroom technicians.

Most semiskilled workers are employed by large photofinishing labs that specialize in processing film for amateur photographers. A large proportion of darkroom technicians work in photo labs operated by portrait and commercial studios and by manufacturers, newspaper and magazine publishers, advertising agencies, and other organizations. Darkroom technicians also work in commercial labs that specialize in processing the work of professional photographers.

Photo lab workers are situated in all parts of the country, but employ-

ment is concentrated in the more populous areas such as New York, Los Angeles, and Chicago.

Training, Other Qualifications, and Advancement

Most darkroom technicians learn their skills through informal on-the-job training. Beginners start as helpers and gradually learn to develop and print film by assisting experienced technicians. It generally takes 3 to 4 years to become a fully qualified darkroom technician. Some helpers become specialists in a particular activity, such as printing or developing. Generally, the training time required in order to become a specialist is less than is needed to become an all-round darkroom technician.

When hiring darkroom technician helpers, employers prefer applicants who are high school graduates. Courses in chemistry and mathematics are helpful to people interested in this trade. Some high schools and trade schools offer courses in photography that include training in film processing. The Armed Forces also offer training for darkroom technicians. Experience gained through processing film as a hobby is helpful.

Two-year curricula leading to an associate degree in photographic technology are offered by a few colleges. Completion of college level courses in this field is helpful to people who are interested in supervisory and managerial jobs in photo labs.

Many darkroom technicians eventually become professional photographers. (See statement on Photographers elsewhere in the *Handbook*.) Others advance to supervisory positions in laboratories.

Training requirements for workers in semiskilled photolab occupations range from a few weeks to several months of on-the-job training. For example, film numberers and slide mounters usually can learn their jobs in less than a month, but printer operators and chemical mixers may need several months or longer. For many semiskilled jobs, manual dexterity, good vision including normal color perception, and good hand-eye coordination are important qualifications. However, some laboratories employ blind workers as film splicers and film strippers, since these jobs are performed in the dark to prevent damage to exposed film. Increasingly, photo labs are seeking high school graduates for semiskilled jobs.

Employment Outlook

Employment in photo lab occupations is expected to increase faster than the average for all occupations through the mid-1980's. In addition to jobs from employment growth, many openings will result from the need to replace experienced workers who retire, die, or transfer to other fields of work.

The need for semiskilled workers is tied closely to the growth of amateur photography. Film purchases by amateur photographers are expected to increase very rapidly as a result of rising population and personal income. Improvements in still and movie cameras that make them easier to load and operate also should contribute to increases in the use of film. However, due to the growing popularity of self-processing instant cameras and the increased use of mechanized film processing equipment in photo labs, employment will not grow as fast as the amount of film used.

The need for all-round darkroom technicians is expected to increase as a result of the growing demand for photography in business and government. A major factor contributing to this demand will be the increasing variety of printed matter that is illustrated with photographs. The growing use of photography in research and development activities also will contribute to the demand for darkroom technicians.

Earnings and Working Conditions

Earnings of photo lab workers vary greatly and depend on factors such as skill level, experience, and geographic location. Beginning pay for inexperienced darkroom technicians' helpers ranged from $2.25 to $3.50 an hour in 1974, according to the limited information available. Most of the experienced all-round darkroom technicians and color technicians earned between $3.50 and $6 an hour.

Workers in semiskilled occupations earned from $2.50 to $4.50 an hour. Among these workers, printer operators and chemical mixers generally had the highest earnings.

The majority of photo lab employees work a 40-hour week and get premium pay for overtime. In labs that specialize in processing film for amateur photographers, employees may work a considerable amount of overtime during the summer and for several weeks after Christmas. Many labs employ temporary workers during these seasonal peaks.

Photo lab jobs are not physically strenuous. In many semiskilled occupations, workers perform their jobs while sitting, but the work is repetitious and the pace is rapid. Some workers (for example, printer operators and photocheckers and assemblers) are subject to eye fatigue. Photofinishing labs are generally clean, well-lighted, and air-conditioned.

Sources of Additional Information

For information about employment opportunities in photographic laboratories and schools that offer degrees in photographic technology, write to:

Photo Marketing Association, 603 Lansing Ave., Jackson, Mich. 49202.

Professional Photographers of America, Inc., 1090 Executive Way, Des Plaines, Ill. 60018.

POWER TRUCK OPERATORS

(D.O.T. 922.782 and .883)

Nature of the Work

In the past, manual workers usually did the hard physical labor of moving materials and products. Today, many heavy materials are moved by workers who operate various types of power trucks. A typical truck has a hydraulic lifting mechanism and forks to carry a load or other attachments to make it more versatile. For example, a truck may have a clamp lift to move cartons, bales, or paper rolls, a scoop to lift coal, or a tow bar to pull warehouse trailers.

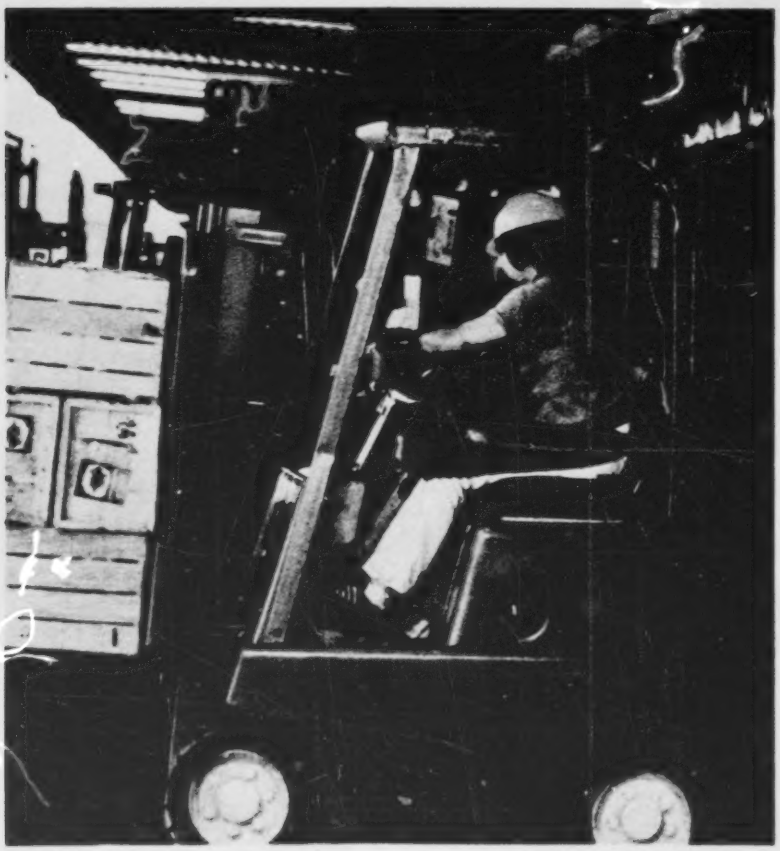
Operators must use care and skill in driving trucks. For example, when loading or removing materials from stock, which may be stacked from floor to ceiling, they must be able to judge distance so that no damage occurs. They also must know the lifting capacity of the truck and the kinds of jobs it can do.

Operators may have to keep records of materials moved and do some manual loading and unloading. They also may be responsible for keeping their trucks in good working condition by cleaning, oiling, checking the water in batteries, and making simple adjustments.

Places of Employment

About 350,000 persons worked as power truck operators in 1974. About three-fourths of them worked in manufacturing industries. Large numbers were employed in plants that made automobiles, machinery, fabricated metal products, paper, building materials, and iron and steel. Many power truck operators also were employed in warehouses, depots, freight and marine terminals, and mines.

Power truck operators are employed in many different industries in all parts of the country. Although some are employed in small towns, most work in heavily populated areas where large factories are located.



Power truck operators can find jobs in many different industries.

Training, Other Qualifications, and Advancement

Most workers can learn to operate a power truck in a few days. It takes several weeks, however, to learn the layout and operation of a plant and the most efficient way of handling materials.

Many companies have formal training programs to teach new employees to operate power trucks, make simple repairs, and handle materials. They also learn plant layout and operation and safe driving rules. Because power trucks are becoming more complex and expensive, firms are expected to place greater emphasis on training programs to increase the skills of their operators.

Employers seek applicants who have manual dexterity, mechanical ability, and above-average eyesight, including good depth perception. Large companies generally require applicants to pass a physical examination.

Opportunities for advancement are limited. A few operators may become supervisors.

Employment Outlook

Employment of power truck operators is expected to increase about as fast as the average for all

occupations through the mid-1980's. In addition to jobs resulting from employment growth, many operators will be needed to replace those who retire, die, or transfer to other occupations.

More goods will be manufactured as population grows and our standard of living rises, and more power truck operators will be needed to move these goods and the materials used to produce them. The need for operators also will increase as more firms use power trucks in place of hand labor to move materials.

Earnings and Working Conditions

According to a survey of metropolitan areas in 1974, power truck operators in manufacturing earned an average of $4.40 an hour, slightly above the average for nonsupervisory workers in all private industries except farming. Earnings of operators varied by region, as shown below:

Area	*Hourly rate*
United States	$4.39
Northeast	4.35
South	3.63
North Central	4.68
West	4.75

Power truck operators are subject to hazards such as collisions and falling objects. They may operate their trucks outdoors where they are exposed to all kinds of weather. Some operators may handle loose material that is dirty or dusty. Moving materials throughout a plant, however, is likely to be less routine and boring than many other production jobs.

A trend toward quieter and more comfortable and better handling trucks has resulted in better working conditions. Also, the increasing use of the relatively noiseless and pollutant free battery-powered truck is doing much to improve the comfort of the operator.

Sources of Additional Information

Information on work opportunities for power truck operators may be available from the local office of the State employment service.

PRODUCTION PAINTERS

Nature of the Work

Almost every metal or wood product manufactured gets a coating of paint or other protection. The majority of painters in factories use spray guns to apply paint, lacquer, varnish, and other finishes. Others operate painting machinery such as spraying machines, dipping tanks, or tumbling barrels. The work of production painters in factories is different from that of skilled painters in construction and maintenance work. (See statements on painters and automobile painters elsewhere in the *Handbook*.)

Most of the work of production painters is repetitive. Spray painters may paint several hundred identical items a day as these products pass by on conveyors. They may have to clean items before painting them and on multicolored ones they apply masking tape to keep colors from overlapping. They follow directions to mix paint and use viscosity meters to make sure the paint is the right consistency. Mixing paint and figuring areas to be painted require simple arithmetic involving decimals and fractions. Painters adjust spray gun nozzles and other controls so that paint will be applied evenly. They also must clean and maintain spray guns and other equipment.

Painting machine operators set up the painting equipment at the beginning of their shift and are responsible for keeping it running. They make sure that the paint is being applied correctly and make adjustments or minor repairs to the machinery if necessary. They may also operate related machines such as washing tanks, used to clean items prior to painting, and baking ovens which dry the painted articles. These painters, especially inexperienced ones, may load items to be painted onto conveyors or into the machinery.

On production lines that use automatic painting machinery, spray painters paint parts of an article that the machine misses. For example, some modern applicators cannot paint inside surfaces, such as the interior of a bucket. Painters use regular spray guns to paint these areas.

Places of Employment

About 125,000 production painters were employed in 1974. About two-thirds of the total worked in plants that made automobiles, machinery, furniture and other wood products, or manufactured metal products such as cans, tinware, and handtools. Although production painters are scattered geographically, large numbers are employed in industrialized States. A fourth of all furniture painters were employed in North Carolina and Pennsylvania, while one-third of all automobile painters worked in Michigan—over half of these in Detroit. Over a quarter of the painters employed by companies making machinery and metal products worked in Ohio and Illinois.

Training, Other Qualifications, and Advancement

New workers often start off loading and unloading items from conveyor lines. After they become familiar with the production process and as openings arise, they may be taught painting skills. They usually learn the work by watching and helping experienced painters. The length of training varies from a few days to several months. Some modern painting processes, such as

those used to apply powdered paints, demand a more skilled painter and thus a correspondingly longer training period. As painters gain experience they can advance to higher skill categories, performing more difficult work.

Production painters should be able to stand for long periods of time. Although they seldom have to lift heavy objects, the production line nature of the job demands continuous physical exertion. High school graduation is generally not required for entry level positions, but a diploma or its equivalent may be needed to advance to higher skill levels.

Opportunities for advancement are limited, although a small number of production painters become supervisors.

Employment Outlook

Employment of production painters is expected to grow at about the same rate as the average for all occupations through the mid-1980's. Many job openings will also result as experienced workers retire, die, or transfer to other occupations.

Most manufacturing industries are expected to increase their output in the years ahead. Demand for consumer products, such as automobiles and furniture, will increase as population and personal income grow. Business growth will create a need for more industrial machinery and equipment. Painters will be needed to apply protective and decorative coatings to these items. Employment of painters, however, is not expected to keep pace with manufacturing output because increased use of automatic sprayers and other laborsaving innovations should raise output per worker.

Earnings and Working Conditions

Hourly wage rates for production painters ranged from about $2.20 to $5.20 in 1974, based on information from a limited number of union contracts. Most painters covered by these contracts earned between $3 and $5 per hour.

Painters are exposed to fumes from paint and paint-mixing ingredients. Some wear protective clothing and masks which cover the nose and mouth. They may also be exposed to noisy factory conditions. When painting large objects, they sometimes work in awkward and cramped positions.

Among unions organizing production painters are the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the United Furniture Workers of America; and the United Steelworkers of America.

Sources of Additional Information

More facts about job opportunities in this field may be available from local offices of the State employment service.

STATIONARY ENGINEERS

(D.O.T. 950.782)

Nature of the Work

Stationary engineers operate and maintain boilers, diesel engines, turbines, generators, pumps, and compressors. The equipment is used to generate power and to heat and air-condition factories and other buildings. Stationary engineers must operate and maintain the equipment according to State and local laws, since the safety of many people depends upon the proper functioning of the equipment.

Stationary engineers, or power engineers as they are often called, detect and identify any trouble that develops by watching and listening to machinery, and by analyzing readings of meters, gages, and other instruments. They operate levers, throttles, switches, valves, and other devices to periodically regulate the machinery, and also record such information as fuel consumption and boiler temperatures and pressure. Stationary engineers also make minor repairs such as reseating valves and replacing gaskets, pumps, and bearings.

In a large plant, the stationary engineer may have charge of the boiler room, and direct the work of assistant stationary engineers, turbine operators, boiler tenders, and airconditioning and refrigeration mechanics. In a small plant, the stationary engineer may operate and maintain equipment by himself.

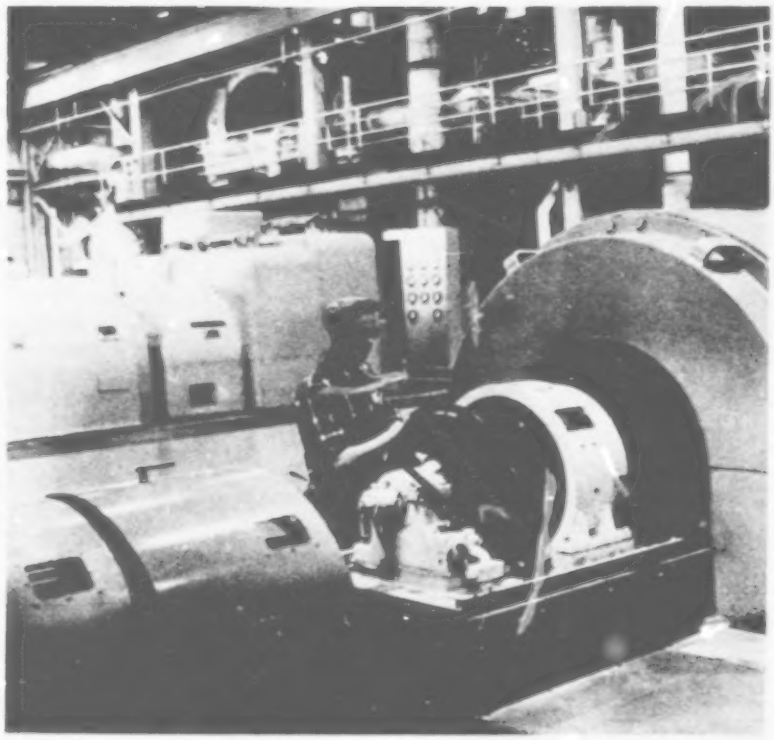
Places of Employment

In 1974, about 193,000 stationary engineers were employed in a wide variety of places, including power stations, factories, sewage and water-treatment plants, office and apartment buildings, hotels, and hospitals. Federal, State, and local governments also employed large numbers of these workers. Most plants which operate on three shifts employ four to eight stationary engineers, but some have more. In many plants, only one engineer works on each shift.

Because stationary engineers work in so many different kinds of industries, they are employed in all parts of the country. Although some are employed in small towns and in rural areas, most work in the more heavily populated areas where large industrial and commercial businesses are located.

Training, Other Qualifications, and Advancement

Many stationary engineers start as helpers or craft workers in other trades and acquire their skills through informal on-the-job experience. However, most training



Stationary engineers operate generators and turbines.

authorities recommend formal apprenticeship programs because of the increasing complexity of the machines and systems.

In selecting apprentices, most joint labor-management apprenticeship committees prefer high school or trade school graduates who have received instruction in mathematics, mechanical drawing, machine-shop practice, physics, and chemistry. Mechanical aptitude, manual dexterity, and good physical condition also are important qualifications.

The apprenticeship usually lasts 4 years. In addition to on-the-job training, apprentices receive classroom instruction in practical chemistry, elementary physics, blueprint reading, applied electricity, and other technical subjects.

Becoming a stationary engineer without going through a formal apprenticeship program usually takes many years of experience as an assistant to licensed stationary engineers or as a boiler tender. This practical experience usually is supplemented by technical or other school training or home study.

Some States, the District of Columbia, and many large and medium-size cities have licensing requirements for stationary engineers. Although requirements for a license differ from place to place, the following are typical: Applicants must be at least 20 years of age; they must reside for a specified period in the State or locality in which the examination is given; and they must meet the experience requirements for the class of license requested and pass an examination which may be written, oral, or both.

Generally, there are several classes of stationary engineer licenses. Each class specifies the steam pressure or horsepower of the equipment the engineer can operate. The chief engineer license permits the stationary engineer to operate equipment of all types and capacities. An applicant for this license may be required to have a high school education and 4 years of approved apprenticeship or on-the-job training. The lower class licenses limit the capacity of the equipment the engineer may operate without the supervision of a higher rated engineer.

Because of regional differences in licensing requirements, a stationary engineer who moves from one State or city to another may have to pass an examination for a new license. However, the National Institute for Uniform Licensing of Power Engineers is now assisting many States in adopting a standardized licensing program that would eliminate this problem by establishing reciprocity of licenses.

Stationary engineers advance to more responsible jobs by being placed in charge of larger, more powerful, or more varied equipment. Generally, engineers advance to these jobs as they obtain higher class licenses. Advancement, however, is not automatic. For example, an engineer who has a first-class license may work for some time as an assistant to another first-class engineer before a vacancy occurs. Some stationary engineers eventually advance to jobs as plant engineers and as building and plant superintendents. A few obtain jobs as examining engineers and technical instructors.

Employment Outlook

Employment of stationary engineers is expected to show little change through the mid-1980's. Nevertheless, several thousand job openings will arise annually because of the need to replace experienced workers who retire, die, or transfer to other occupations.

Industrial growth will result in an increased use of large boilers and auxiliary equipment in factories, powerplants, and other buildings. The need for additional stationary engineers, however, will be limited by the trend to more powerful and more centralized equipment. For example, a large boiler operated by one stationary engineer can supply heat and refrigeration for several buildings, instead of each building having its own small boiler and engineer.

Earnings and Working Conditions

Stationary engineers had average hourly earnings of $5.51 in 1973-74, according to a survey of metropolitan areas. This was higher than the average for all nonsupervisory workers in private industry, except farming. Averages for engineers in individual cities ranged from $3.88 in Greenville, S.C. to $6.55 in the San Francisco area.

Stationary engineers generally have steady year-round employment. They usually work a 5-day, 40-hour week. In plants that operate around the clock, they may be assigned to any one of three shifts—often on a rotating basis—and to Sunday and holiday work.

Engine rooms, powerplants, or boiler rooms usually are clean and well-lighted. Even under the most favorable conditions, however, some stationary engineers are exposed to high temperatures, dust, dirt, contact with oil and grease, and fumes or smoke. They may have to crawl inside boilers and work in crouching or kneeling positions to inspect, clean or repair the interiors.

Because stationary engineers often work around boilers and electrical and mechanical equipment, they must be alert to avoid burns, electric shock, and injury from moving machinery.

Among the unions to which these workers belong are the International Union of Operating Engineers and the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America.

Sources of Additional Information

Information about training or work opportunities is available from local offices of State employment services, locals of the International Union of Operating Engineers, and from State employment services, locals of the International Union of Operating Engineers, and from State and local licensing agencies.

Specific questions about the occupation may be referred to:

International Union of Operating Engineers, 1125 17th St. NW., Washington, D.C. 20036.

National Association of Power Engineers, Inc. 176 West Adam St., Chicago, Ill. 60603.

For questions concerning licensing requirements, contact:

National Institute for Uniform Licensing of Power Engineers, 176 West Adam St., Chicago, Ill. 60603.

WASTEWATER TREATMENT PLANT OPERATORS (Sewage-Plant Operator)

(D.O.T. 955.782)

Nature of the Work

Clean water is essential for our health and recreation and for the existence of fish and wildlife. Wastewater treatment plant operators help keep America's water clean by removing harmful domestic and industrial waste.

Waste materials are carried by water through sewer pipes to treatment plants. Operators control equipment to remove these materials or render them harmless. By operating and maintaining pumps, pipes, and valves that connect the collection system to the treatment facility, operators move the wastewater through the various treatment processes.

Operators read and interpret meters and gauges to make sure plant equipment is working properly. Other jobs include operating chemical feeding devices to remove pollutants from wastewater; taking samples of the water for laboratory analysis; and testing and adjusting the level of chlorine in the water. Operators also make minor repairs on valves, pumps, and other equipment. They use gauges wrenches, pliers, and other common handtools, as well as special tools. Occasionally operators must work under emergency conditions—for example, a heavy rainstorm may cause abnormal amounts of wastewater to flow into sewer pipes and threaten to exceed a plant's treatment capacity.

The duties of operators vary depending on the type and size of plant. For example, the treatment process in an industrial plant such as a food-processing company, may be simple since the wastewater is of a known content. Treatment plants which serve entire cities, on the other hand, must be equipped to treat a mixture of waste products that varies daily, thus making the operator's job more complicated. In smaller plants, one operator may be responsible for the entire system—making repairs, keeping plant records, handling complaints, and doing the maintenance work for the facility. In larger plants, the staff may include chemists, laboratory technicians, mechanics, helpers, supervisors, and a superintendent.

As a result of the passage of the 1972 Federal Water Pollution Control Act, water pollution standards will become increasingly stringent in the future. In order to meet these higher requirements, operators will have to be able to operate more sophisticated systems.

Places of Employment

About 62,000 people worked full time as wastewater treatment plant operators in 1974, of whom about 35,000 worked in municipal plants, 25,000 in private industry, and 2,000 in Federal installations. In addition, over 50,000 operators performed operator duties in addition to other related duties.

Wastewater treatment plant operators are employed throughout the country. Geographically, employment is distributed much like the Nation's population, with most jobs in larger towns and cities. Many operators in small towns are employed part time.

Training, Other Qualifications, and Advancement

Trainees usually start as helpers and learn their skills on the job under the direction of an experienced operator. They learn by doing routine tasks such as recording meter readings; taking samples of wastewater and sludge; and doing simple maintenance and repair work on pumps, electric motors, and valves. They also are expected to perform housekeeping tasks such as cleaning and maintaining plant equipment and property.

Persons interested in entering the field should have some mechanical aptitude and should be competent in basic mathematics. Employers generally prefer trainees who have a high school diploma or its equivalent, and in some States this is a minimum educational requirement. Some positions, particularly in larger cities and towns, are covered by civil service regulations, and applicants may be required to pass written examinations testing elementary mathematics skills, mechanical aptitude, and general intelligence. Operators must be agile, since they have to climb ladders and move easily around heavy machinery.

Some 2-year programs leading to an associate degree in wastewater technology are available; these provide a good general knowledge of the water pollution control field as well as basic preparation for becoming an operator. Since plants are becoming more complex, completion of such courses increases an applicant's chances for employment and promotion.

Most State water pollution control agencies offer training courses to improve the skills of treatment plant operators. These courses cover principles of sludge digestion, odors and their control, chlorination, sedimentation, biological oxidation, and flow measurements. Some operators take correspondence courses on subjects related to wastewater treatment, and some employers will pay part of the tuition for courses leading to a college degree in science or engineering.

Operators may be promoted to positions such as supervisor and superintendent. Superintendents of large and complex plants are expected to have an engineering or science degree. A high school diploma and increasingly responsible experience may be sufficient to qualify as superintendent of a small or medium-sized plant at present, but educational requirements are rising as more complex treatment plants are built to meet new water pollution control standards. Since many new and existing plants are being organized on a regional basis, it is becoming increasingly important for operators to receive some training in management techniques. A limited number of operators may become technicians employed by State water pollution control agencies to monitor and provide technical assistance to plants throughout the State. Some technical-vocational school or junior college training is generally preferred for technician jobs.

In 40 States, supervisors and certain operators must pass an examination to certify that they are capable of overseeing treatment plant operations. Voluntary certification programs are in effect in the remaining States, with the exception of Alaska.

Under a typical program, there are different classes of certification for different sizes of treatment plants. For example, to be certified a "Class I operator" capable of operating a small plant with simple equipment, an applicant should be a high school graduate, demonstrate general knowledge of treatment operations by passing a written test, and complete 1 year of satisfactory employment at a treatment plant. Requirements for certification as a Class IV operator who supervises a large plant employing complex technology may require a bachelors degree in science and engineering; 4 years of treatment plant experience, 2 years of which were in a position of major responsibility; and specific knowledge of the entire field of wastewater treatment as demonstrated through a written test.

Employment Outlook

Employment of wastewater treatment plant operators is expected to increase much faster than the average for all occupations through the mid-1980's, mainly as a result of the construction of new treatment plants to process the increasing amount of domestic and industrial wastewater. Also, more highly trained operators will be needed as existing plants expand and modernize their facilities to cope more effectively with water pollution. In addition to new jobs from employment growth, many job openings will occur as experienced operators retire, die, or transfer to other occupations.

People who enter this field should have fairly steady employment in the years ahead. Even during economic downturns treatment plants seldom lay off employees.

Earnings and Working Conditions

It is estimated that the earnings of operators ranged from about $6,500 to $20,000 a year in 1974, based on information from several surveys covering a number of cities throughout the United States. Operators at the supervisory level could earn even more. Salaries for trainees were roughly 80 percent of operators' salaries in most cities.

Because pollution control is a never-ending task, operators work different shifts and in an emergency may have to work overtime. Operators may be exposed to unpleasant odors, as well as noise from the operation of electrical motors and pumps. However, odor is kept to a minimum by the use of chlorine or other chemicals.

Sources of Additional Information

People interested in a career in wastewater treatment should contact their local or State water pollution control agencies. Additional information is available from:

Water Pollution Control Federation, 3900 Wisconsin Ave., NW., Washington, D.C. 20016

Environmental Protection Agency, Office of Water Programs Operations, Manpower Development Staff, 401 M St. SW., Washington, D.C. 20460.

WELDERS

(D.O.T. 810. through 819.887)

Nature of the Work

Welding consists of joining two pieces of material, usually metal, by melting them together. It is the most common method of permanently connecting various metal parts that go into the construction of automobiles, spacecraft, ships, household appliances, and thousands of other products. Beams and steel reinforcing rods in bridges, buildings, and roads frequently are joined by welding. In addition, a growing number of plastic parts are welded to make a variety of products.

Welding processes differ by the way heat is created and applied to the parts being joined. For example, in arc welding, the most frequently used process, heat is created as electricity flows across an airspace from the tip of the welding tool to the metal. In resistance welding, the heat is created by electricity flowing directly through the metal. In gas welding, the heat of burning gases melts the metal. As part of most welding processes, special filler materials, called welding electrodes or welding rods, usually are melted in with the metal to give the joint greater strength. Once the heat is removed, the metal and filler material harden and connect the parts. It is the welder's job to heat the metal and filler material so that they melt together properly and harden into a strong joint.

Because welding processes differ and are used for a wide variety of purposes, the equipment welders use and the skill levels of welders vary. Jobs vary from those of highly skilled manual welders who can use gas and electric arc welding equipment in more than one position and who can plan their work from drawings or other specifications to those of unskilled welding machine tenders who simply press a button to start a machine. Skilled welders know the characteristics of steel, bronze, aluminum, and other metals and can weld joints held in various positions. Welders who construct ships and maintenance welders are examples of skilled welders.

Welders use special masks and heavy gloves to prevent injuries.

Ship welders join the steel plates and beams used to build ships. Some joints to be welded are on the floor, some are on the wall, and some are overhead on the ceiling. All must be carefully welded to insure that the ship will not break apart in rough seas.

Ship welders generally use arc welding equipment because it welds the steel plates faster and better than gas equipment. After reading instructions on construction plans to learn which rods to use and obtaining a supply of rods from the storage area, ship welders are ready to begin work. First, they insert a rod in a holder attached to an electric cable from a gasoline-powered generator or other source of electricity. Another electrical cable is attached to the metal being welded and controls are adjusted to provide the right amount of electricity. Next, welders "strike an arc" by briefly touching the rod to the metal to start the electricity flowing and then pulling the rod back to create a small space which the current must jump. If the distance between the rod and the metal is correct, electricity continues to flow through the rod and across the space, creating an electric arc; the heat from the electric arc melts the rod and the metal. Welders move the arc along the joint and as the rod melts and becomes shorter, move the rod closer to the metal to keep the tip at the proper distance. When the rod becomes very short, welders replace it.

Maintenance welders repair tools, machines, and equipment—for example, a farmer's plow. In this case, welders bring their equipment to the job. Gas welding generally is preferred because the torch, hoses, and tanks of gas are portable.

After examining the plow and preparing the break for repair—usually by grinding—maintenance welders select the proper welding rod for the job. Next, they light the torch and adjust valves on the tanks of acetylene and oxygen to obtain the right flame. With the welding rod in one hand and the torch in the other, they heat the edges of the crack in the plow and apply the heat. As the metal begins to melt, the welders periodically melt the end of the welding rod in the hot, liquid metal while they carefully move the torch and rod along the crack to complete the repair. Welders must be careful to keep the torch at the right distance from the metal in order to apply the heat correctly and to add filler material, as needed, to fill the crack.

Not all welders have the skills of shipbuilding or maintenance welders. For example, less skilled workers use semiautomatic arc welding equipment to speed up the job of welding automobile frames. Semiautomatic equipment consists of a welding gun which welders must position but which automatically supplies the proper amount of electricity and filler material to the joint. In this example, assembly lines bring car frames to welders and put them in place. Welders then position their welding guns on the parts to be welded, push a button on the tool, "strike an arc," and guide the arc to complete one or two joints before the assembly line takes the frame to another worker. Like skilled welders, these welders are responsible for the strength of the joint. However, they need less skill because all parts they weld are identical and each welded from the same position as the others.

If the factory is large, and many identical parts must be welded, the company may save money by using automatic welding machines. Such machines are used, for example, in making automobile mufflers and washing machines. The workers who operate these machines need little knowledge of welding and are frequently called welding machine tenders to distinguish them from more skilled, manual welders. Welding machine tenders place the parts to be joined in holders on the machine. To complete the weld, tenders simply push a button. The machine then clamps the part in place and rotates it, as necessary to complete the welding cycle. The welding machines, not the operator, are responsible for the weld. After the welding cycle is finished, tenders remove the welded material and load the machine again.

Closely related to welders are cutters. The workers use the heat from burning gases or an electric arc to cut and trim metal rather then join it. Some cutters operate electrically or mechanically controlled machines which automatically follow the proper guideline.

Places of Employment

About 645,000 welders and flame cutters were employed in 1974, including a relatively small number of flame and arc cutters. Over one-half of all welders help manufacture durable goods; for example, boilers, bulldozers, trucks, ships, and heavy machinery. About one fourth repair metal products, while most of the rest help construct bridges, large buildings, and pipelines.

Welders are concentrated in the manufacturing centers of the Great Lakes States. About one-third work in Pennsylvania, Ohio, Michigan, Indiana, and Illinois. Because of the widespread use of welding, the rest are distributed much the same as population, with large numbers working in New York, Texas, and California.

Training, Other Qualifications, and Advancement

Generally, it takes several years of training to become a skilled welder. Some of the less-skilled jobs, however, can be learned in a few months of on-the-job training. Welding machine tenders, for example, can be taught to operate a machine in a few hours and become completely qualified in a week.

Beginners often start in simple production jobs where the type and thickness of the metal, as well as the position of the welding operation rarely change. As the need arises, supervisors teach new employees how to weld different types of metal, and how to weld vertical and overhead joints. Some large companies conduct programs to train persons as welders. After completing the course, individuals are offered jobs. A few companies offer employees welder apprenticeship programs that last 4 years, including classroom and on-the-job training.

Persons planning careers as welders or cutters need manual dexterity, good eyesight, and good eye-hand coordination. They should be able to concentrate on detailed work for long periods, and should be free of any physical disabilities that would prevent them from bending, stooping, and working in awkward positions. Many employers prefer applicants who have high school or vocational school training in welding. Courses in shop mathematics, mechanical drawing, blueprint reading, and physics also are helpful.

New developments are requiring new skills of welders. This is particularly true in fields such as atomic energy or missile manufacturing, which have high standards for the reliability of welds. Before being assigned to work on buildings, bridges, or other jobs where the strength of the weld is highly critical, welders may be required to pass an examination of their welding skills given by an em-

ployer or government agency. Welders who pass such examinations are generally referred to as "certified welders."

Promotion opportunities for welders are good. Welding machine tenders may learn skilled welding jobs; skilled welders may be promoted to welding inspectors, technicians, or supervisors. Experienced workers who have obtained college training on the properties of metal are in great demand to develop new applications for welding. A small number of experienced welders open their own welding repair shops.

Employment Outlook

Job opportunities for welders should be very good in the years ahead. Employment in this field with many jobs is expected to increase faster than the average for all occupations through the mid-1980's as a result of the generally favorable long-run outlook for metalworking industries and the greater use of welding. In addition to job openings created by employment growth, thousands should be available each year because of the need to replace experienced welders who retire, die, or transfer to other occupations. Job opportunities may vary, however, because welder employment in manufacturing industries fluctuates with ups and downs in the economy.

Increases in population and income are expected to stimulate demand for cars, buildings, heavy machinery, appliances, and thousands of other products which welders help make. Employment of welders also is expected to increase as welding replaces other methods of joining metals. Welding generally is cheaper than other methods of joining metal parts, and is being used more and more frequently in the manufacturing and construction industries.

Employment opportunities should be especially good for skilled welders in nuclear powerplant, pipeline, and ship construction jobs. Recent reports indicate that a shortage of skilled welders exists in these industries.

Earnings and Working Conditions

National wage data on welders are not available. However, the limited data vailable indicate welding machine tenders earned from $3.93 to $5.10 in 1974. Welders in the construction industry earned $4.50 to $10 an hour, depending on location.

Welders and cutters use protective clothing, safety shoes, goggles, helmets with protective lenses, and other devices to prevent burns and eye injuries. Although lighting and ventilation are usually adequate, they occasionally work in the presence of poisonous gases and fumes caused by the melting of some metals. They are often in contact with rust, grease, and dirt on metal surfaces. Welding machine tenders are largely free from the hazards associated with hand welding. An eyeshield or goggles generally offer adequate protection to these workers.

Many welders are union members. However, because welding is also done by other craft workers, for example by pipefitters, and has only recently been receiving recognition as a distinct craft, welders belong to many different unions. Among these are the International Association of Machinists and Aerospace Workers; the International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada; and the United Electrical, Radio and Machine Workers of America (Ind.). Only one labor organization—the International Union, United Welders (Ind.),

Sources of Additional Information

For further information on training and work opportunities for welders, contact local employers or the local office of the State employment service. For general information about welders, write to:

The American Welding Society, 2501 NW. 7th St., Miami, Fla. 33125.

International Union, United Automobile, Aerospace and Agricultural Implement Workers of America, 8000 East Jefferson Ave., Detroit, Mich. 48214.

OFFICE OCCUPATIONS

Office workers perform a wide range of tasks that are needed to keep business and other organizations running on a day to day basis. Clerical workers, such as secretaries and typists, maintain files, type, and operate office machines. Professional and technical employees give legal advice, prepare and analyze financial reports, design computer systems, and arrange bank loans.

Opportunities in office work exist for people with widely different educational backgrounds. Some jobs can be entered with only a high school education; many others, however, require at least a college degree.

Many clerical employees work with things and often do detailed, repetitive tasks. Most professional office workers, on the other hand, work with ideas; they apply their skills to solving problems and devising ways to provide better services to those who depend on them. Besides the technical skills required to do their jobs, office workers need judgment and the ability to communicate their ideas to others.

This chapter of the *Handbook* describes office work in Clerical Occupations, Computer and Related Occupations, Banking Occupations, Insurance Occupations, and Administrative and Related Occupations.

CLERICAL OCCUPATIONS

About 15 million people worked in clerical jobs in 1974. Many keep records and do other office paperwork. Others handle communications, operate office machines, ship and receive merchandise, and ring sales on cash registers.

Workers in clerical jobs have a wide variety of skills and experience. They include highly skilled title searchers in real estate firms and executive secretaries in business offices as well as relatively unskilled messengers and file clerks. Despite the diversity of jobs and duties, much clerical employment is concentrated in just a few familiar jobs. Roughly 1 of every 5 clerical workers is a secretary or stenographer. One in ten is a bookkeeper. The accompanying chart shows employment in these and other major clerical occupations discussed in the *Handbook*.

Training, Other Qualifications, and Advancement

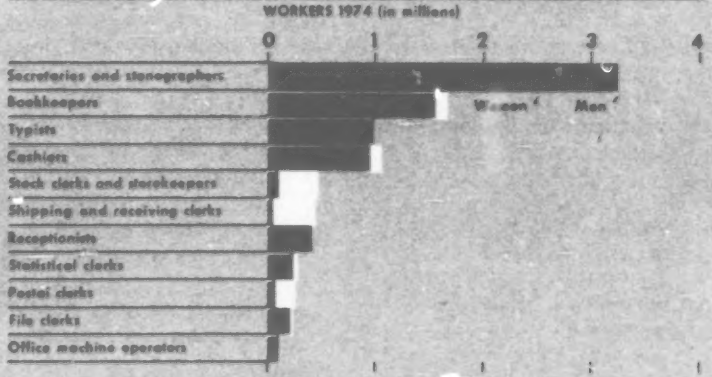
Clerical workers need high school diplomas for all but the most routine jobs, and many employers prefer applicants who have had business courses. Some companies cooperate with local high schools and business schools in office education programs that enable students to work part time while attending school. This experience is helpful for beginners seeking jobs after graduation. Many States and localities sponsor programs to train unemployed and low-skilled workers for entry level clerical jobs.

Beginning clerical workers often receive on-the-job training. They learn how their employers keep records and become familiar with the kinds of business forms used. Some new workers learn to operate adding and duplicating machines and other kinds of office equipment. They may attend classes to learn how to operate tabulating machines and other specialized equipment. Secretaries, stenographers, and typists need special skills that must be learned in schools or formal training programs.

Many clerical jobs require reading comprehension, a knowledge of spelling and grammar, and arithmetic skills. Employers prefer applicants for almost all clerical jobs to have basic typing skills. Some employers test applicants for clerical aptitude.

Advancement opportunities for clerical workers are good, and many employers provide courses so that their employees can learn the skills needed for more demanding jobs. As workers become more highly skilled, they are assigned more difficult tasks. For example, junior typists may be promoted to more responsible jobs as senior typists as their typing speed and accuracy improves. Receptionists who learn typing and office procedures may become secretaries or typists. Promotion to supervisor or manager generally depends on leadership ability, work experience, and knowledge of the overall operations of the organization.

A Majority of the Approximately 15 Million Clerical Workers are Employed in These Occupations 11



Source: Bureau of Labor Statistics

Employment Outlook

Employment of clerical workers is expected to increase faster than the average for all occupations through the mid-1980's. In addition to the many new jobs created by this growth, about a million job openings a year will occur as employees die, retire, or leave their jobs.

Future growth in the number of clerical workers is expected to result primarily from the increasing paperwork that will accompany the expansion of large and complex organizations. A great deal of this paperwork is handled by computer.

The impact of automation on office equipment and procedures is considerable, but it is more important in some jobs than in others. In general, long-term employment prospects are best in clerical occupations which are not affected by automation, in those which are compatible with computer applications, and in jobs which have developed as a result of new technologies. Job opportunities are especially favorable for receptionists, secretaries, typists, and computer operators. Demand for these workers will be particularly strong in banks, insurance companies, manufacturing firms, and professional service organizations.

As more firms use computers and business machines, routine clerical jobs such as payroll, bank, and file clerk may be reduced or eliminated. However, as work is shifted from clerks to machines, many jobs will be created for clerical workers who are familiar with computer operations, particularly in large firms.

Persons with clerical skills, particularly secretarial and typing skills, should find extensive opportunities for temporary or part-time work as more employers use these workers during peak business periods.

Earnings and Working Conditions

Clerks in routine jobs earned as little as $95 a week, while many highly skilled workers were paid $200 or more, according to a 1974 survey. Salary variations within an occupation are relatively common and these usually reflect differences in educational level, work experience, and level of responsibility.

Salaries in different parts of the country also vary; earnings generally are lowest in southern cities and highest in northeastern and western urban areas. For example, secretaries averaged $166 a week in the Northeast, $165 in the West, and $149 in southern cities.

Clerical employees work a 40-hour week in most cities. In some, especially in the Northeast, the scheduled work week is 35 hours.

Most clerical workers in large cities receive 7 paid holidays or more a year and 2 weeks' vacation after working 1 year. Longer vacations, based on added years of service, may range to 4 weeks or more. Group life and health insurance plans, sick benefits, and retirement plans often are available.

Sources of Additional Information

Many State employment service offices can provide information about earnings, hours, and employment opportunities in clerical jobs.

Information concerning training for clerical occupations in your State is available from:

State Supervisor of Office Occupations Education, State Department of Education, State capital

A directory of private business schools located in cities throughout the country may be obtained from:

United Business Schools Association, 1730 M St., NW., Washington, D.C. 20036.

BOOKKEEPING WORKERS

(D.O.T. 210.368 through .588, 216.388, and 219.388 and .488)

Nature of the Work

Every business needs systematic and up-to-date records of accounts and business transactions. Bookkeeping workers maintain these records in journals, ledgers, and on other accounting forms. They also prepare periodic financial statements showing all money received and paid out. The duties of bookkeeping workers vary with the size of the business.

In many small firms, *general bookkeepers* (D.O.T. 210.388) are the only bookkeeping workers. They analyze and record all financial transactions, such as orders and cash sales. They also check money taken in against that paid out to be sure accounts "balance," and calculate the firm's payroll. Although most of this work is done by hand, occasionally bookkeepers use simple office equipment such as adding machines. General bookkeepers also prepare and mail customers' bills and answer the telephone.

In large businesses, a number of bookkeepers and accounting clerks work under the direction of a head bookkeeper. Bookkeepers often specialize in certain types of work such as preparing statements on a company's income from sales or its daily operating expenses. They sometimes use complex bookkeeping machines to perform these duties. *Accounting clerks* (D.O.T. 219.488), sometimes known as bookkeeping clerks, perform a variety of routine duties. They record details of business transactions, including deductions from payrolls and bills paid and due. They also may type vouchers, invoices, and other financial records.

Places of Employment

Bookkeeping workers numbered almost 1.7 million persons in 1974. About 90 percent were women. Jobs for bookkeeping workers are found in all kinds of firms, with an especially large number in wholesale and retail trade. One of every three bookkeepers works for a retail store or wholesale firm. In addition, many work in factories, banks, insurance companies, hospitals, and schools.

Training, Other Qualifications, and Advancement

High school graduates who have taken business arithmetic, bookkeeping, and accounting meet the

minimum requirements for most bookkeeping jobs. Some employers, however, prefer applicants who have completed business courses at a junior college or business school.

Persons also may qualify for bookkeeping jobs through on-the-job training. In some areas, companies cooperate with business schools and high schools in work-study programs. These programs offer part-time experience that helps students get jobs soon after graduation.

Bookkeeping workers need above average aptitude for working with numbers and a knack for concentrating on details. They should be able to type and operate various office machines. Because they depend on other office workers for information, bookkeepers should be able to work as part of a team.

Newly hired bookkeeping workers begin by recording routine transactions. They advance to more responsible assignments, such as preparing income statements and operating complex bookkeeping machines. Some workers are promoted to supervisory jobs. Bookkeepers who complete courses in college accounting may become accountants. (The occupation of accountant is discussed elsewhere in the *Handbook*.)

Employment Outlook

Thousands of job openings for bookkeepers are expected every year through 1985. Jobs will be numerous even though bookkeeper employment is expected to grow slowly over the next 10 years or so, for the occupation is large and turnover is high. Most job openings for bookkeepers will occur because of the need to replace workers who die, retire, or stop working for other reasons.

Future employment growth in this occupation will be slowed by the increasing use of electronic data processing and various types of bookkeeping machines. Many machines can process data more accurately, rapidly, and economically than workers doing it by hand. Nevertheless, need for bookkeeping workers is expected to outpace the impact of laborsaving office machines over the next decade.

Capable workers advance quickly to more difficult work using a bookkeeping machine.

Earnings and Working Conditions

Beginning accounting clerks in private firms averaged $551 a month in 1974, according to a Bureau of Labor Statistics survey of clerical occupations. They had higher salaries, on the average, than beginning file clerks or typists, but earned less than beginning secretaries or stenographers. Experienced accounting clerks earned $697 a month, about the same as the average for all nonsupervisory workers in private industry, except farming.

In late 1974, starting salaries in the Federal Government ranged from $5,996 (GS-2) to $6,764 (GS-3) for bookkeeping workers right out of high school. Starting salaries were higher for bookkeeping workers with at least 2 years' work experience or 2 years of college education. These salaries ranged from $7,596 (GS-4) to $8,500 (GS-5) per year. Average salaries in the Federal Government in late 1974 for general accounting clerks were $12,800 per year.

Working conditions for bookkeepers are similar to those of other

office workers in the same firms. (See introductory section to this chapter for more information on earnings and working conditions and for sources of additional information.)

CASHIERS

(D.O.T. 211.138, .368, .468, .488, and 299.468)

Nature of the Work

Supermarkets, movie theaters, and restaurants are among the many businesses that employ cashiers to handle payments from customers. Most cashiers receive money, make change, fill out charge forms, and give receipts. (Since it is different from other cashier jobs, the occupation of bank cashier is discussed elsewhere in the *Handbook*.)

In addition to these duties, cashiers, depending on their employers, may do other jobs and have different job titles. Those who work in theaters, for example, are often called *box office cashiers* or *ticket sellers*. They operate ticket-dispensing machines and answer telephone inquiries. Restaurant cashiers, sometimes called *cashier checkers*, handle reservations for meals and special parties, type menus, or sell items at the candy and cigarette counter. In supermarkets and other self-service stores, cashiers known as *check-out clerks*, *checkers*, or *grocery clerks* wrap or bag purchases and, during slack periods, may restock shelves and mark prices. In many offices, cashiers known as *agency* or *front office cashiers*, type, operate the switchboard, do bookkeeping, and act as receptionists.

Cashiers operate several types of machines. Many use cash registers which print the amount of the sale on a paper tape. However, a rapidly growing number of cashiers operate computerized point-of-sale registers that automatically calculate the necessary taxes and record inventory numbers and other information. Point-of-sale registers are replacing less versatile models in many stores. Cashiers who work in hotels and hospitals use machines that record charges for telephone, medical, and other services and prepare itemized bills. Cashiers also operate adding and change-dispensing machines.

Places of Employment

In 1974, about 1.1 million persons, over 85 percent of them women, worked as cashiers. More cashiers work in supermarkets and grocery stores than in any other kind of store. However, cashiers are needed in businesses of all types and sizes, and many find jobs in department stores, drugstores, shoestores, hardware stores, furniture stores, and in other kinds of retail stores. Restaurants and theaters also employ a large number of cashiers. Most of the businesses employing cashiers are located in cities or suburban shopping centers; however, many are in small towns.

Opportunities for part-time work are very good. Nearly half of all cashiers work part time; one in four is a student.

Training, Other Qualifications, and Advancement

Employers prefer beginning cashiers with high school diplomas. Courses in business arithmetic, bookkeeping, typing, and other business subjects are good preparation for cashier jobs. Cashier training is offered as part of many public school vocational programs.

Many employers offer on-the-job training for cashiers. In a small firm,

the beginning cashier is trained on the job by an experienced worker. In large firms, cashier training programs often include classroom instruction in use of the point-of-sale register and in other phases of cashiers' jobs.

For some cashier jobs, employers seek persons who have special skills or business experience, such as typing or selling. Many cashier openings are filled by promoting clerk-typists in offices, stock clerks and baggers in supermarkets, and other qualified workers already employed by the firm.

Persons who want to become cashiers should be able to do repetitious work accurately. They need finger dexterity, a high degree of eye-hand coordination, and an aptitude for working with figures. Because they meet the public, cashiers should be neat in appearance and able to deal tactfully and pleasantly with customers.

Promotion opportunities for cashiers tend to be limited. However, the cashier's job affords a good opportunity to learn an employer's business and so may serve as a steppingstone to a more responsible clerical job or managerial position. Cashiers working in chainstores and other large retail businesses, for example, may advance to department or store managers.

Employment Outlook

Job openings for cashiers are expected to be plentiful through 1985. Employment is expected to grow about as fast as the average for all occupations. New jobs will result from future business growth, particularly in retail trade. More important than growth as a source of jobs for cashiers, however, is the need to replace workers who die, retire, or stop working for other reasons. Because the occupation is large and turnover is high, many cashier jobs will be available over the next 10 years.

Future employment of cashiers is likely to be affected by the use of computerized checkout systems, which are beginning to replace cash registers in some supermarkets. An optical or magnetic scanner transmits the code number of each purchase to a computer which is programmed to record the price of the item, add the tax, and print out a receipt. The computer also keeps track of the store's inventory and places orders with the warehouse when stock is needed. With this system, more of the work is handled by machine, and supermarkets may not need as many stock clerks and cashiers. Employment growth is expected to slow with eventual widespread adoption of automated checkout systems.

Earnings and Working Conditions

Beginning cashiers often earn the minimum wage required by law. In several States and in establishments covered by the Federal law, the minimum was $1.90 or $2 an hour in 1974. Unionized cashiers, many of them grocery checkers in supermarkets, had average earnings in 1974 which ranged from $3.30 to $5.90 an hour for experienced workers in metropolitan areas.

Cashiers often work during rush periods such as holidays, weekends, late afternoons, and evenings. Work at these times often is required in theaters, restaurants, and foodstores. Many cashiers in these places work part time or on split shifts. Full-time cashiers in supermarkets and other large retail stores usually work a 5-day, 40-hour week; however, they generally work on Saturday and have another day off during the week.

Most cashiers work indoors, often in small booths or behind counters located near store entrances. In some cases, they are exposed to cold drafts in the winter and considerable heat during the summer. (See introductory section of this chapter for sources of additional information.)

COLLECTION WORKERS

(D.O.T. 240.368)

Nature of the Work

Companies that lend money or extend credit expect to be repaid. However, customers who "buy now" are not always able to "pay later." Collection workers, often called bill collectors, help maintain a company's financial well-being by keeping bad debts to a minimum.

A collector's primary job duty is to convince people to make good on unpaid bills. The collector usually receives a bad debt file after normal billing methods, such as monthly statements and collection form letters, have failed to elicit payment. The file contains information about the debtor, the nature and amount of the unpaid bill, and the last time payment was made.

The collector then contacts the debtor, determines why the bill is unpaid, and tries to get the debtor to pay or make new arrangements for payment.

The approach that collectors use depends on the type of payment problem they are handling. Sometimes customers feel that the bill is incorrect, or that the merchandise they bought is faulty, or that services they were billed for were not properly performed. Collectors normally recommend that the debtors resolve these disagreements by contacting the original sellers. In large stores, problems are referred to special "customer service" departments, set up to deal with disputed accounts. If the problems are not settled, the collectors again contact the customers to convince them that they were properly charged and should pay the debts.

When customers have met with financial emergencies or mismanaged their money, collectors may work out new payment

schedules. If collectors find customers fraudulently avoiding payment of their bills, they may recommend that the files be turned over to an attorney.

When a debtor moves without leaving a forwarding address, the collector may inquire at the post office, search telephone directories, and call on the person's friends and former neighbors. In large collection operations, this may be done by collection workers known as "tracers."

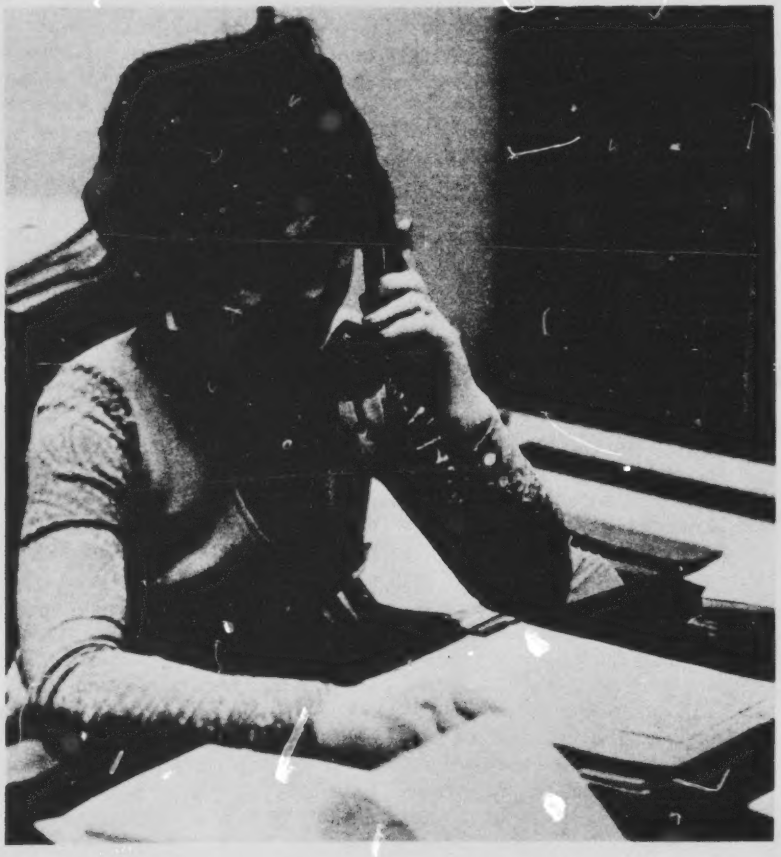
In small organizations, bill collectors may perform other functions besides contacting delinquent customers. They may advise customers having financial problems, or contact customers to determine if they are satisfied with the way their accounts are being handled. Some collectors supervise the repossession procedure for businesses that reclaim goods when payment is not made.

Although most collectors do their work by phone, some make personal visits to the debtor. These visits usually are necessary when a large amount of money is involved and the debtor has been unresponsive to phone contact.

Places of Employment

About 60,000 persons—over a third of them women—were collection workers in 1974. Although collectors work for a variety of businesses, most are employed by banks, loan companies, and collection agencies. Many others work for retail and wholesale businesses.

Jobs for collectors are found throughout the United States, but opportunities are best in heavily populated urban centers. Many firms having branch offices in rural areas locate their collection departments in the business district of nearby cities.



Training, Other Qualifications, and Advancement

A high school education usually is sufficient for entry into the collection field. Because a collector handles delinquent accounts on a person-to-person basis, high school courses in psychology and speech may be useful. Previous employment as a sales clerk can help the collection worker learn how credit transactions originate and how they are handled at the point of sale. Knowledge of a foreign language may be an asset for persons seeking collection jobs in areas with large non-English-speaking populations.

Most of a collector's training is on the job. The employer may provide training manuals that explain collection procedures, but more often the new employee gains collection skills informally. For example, the new collector learns telephone techniques by listening as experienced workers make collection calls.

A collector's most important asset is the ability to get along with different people. He or she must be alert, imaginative, and quick-witted to handle the difficult situations that are a part of collection work. While collectors should be sympathetic to the bill-payers' problems, they also must be persuasive to overcome some debtors' reluctance to fulfill their financial obligations. Because a collector spends most of the day on the telephone, a pleasant speaking voice and manner are important.

The collector's job generally offers limited opportunities for advancement; competition for the few supervisory positions is keen. The collector with above-average abilities, however, may become a col-

lection manager or supervisor of a staff of collectors. Some collection workers progress to other positions in the credit field, such as bank loan officer or outside representative for a collection agency. Further education, such as that available through professional associations of collectors or college courses, may be helpful for advanced positions in the credit and collection field.

Employment Outlook

The applicant with a background of high school business courses who can demonstrate effective telephone skills should find job opportunities available in the collection field. In the past, some jobseekers have been reluctant to accept collection work. More recently, however, the image of the occupation has improved. The role of the collector has expanded to include customer debt counseling, and collection methods have been modified in line with modern management techniques and recent consumer legislation. Despite this improved image, the number of persons seeking collection jobs is expected to fall short of the need for additional workers. Employers will need large numbers of collectors to fill vacancies created by deaths and retirements, and many new positions will open up as the occupation grows, at a rate faster than the average for other career areas.

Employment opportunities should be best in collection agencies, where replacement needs continue to be high, and in retail trade firms, where earnings often are somewhat lower than the average. The strongest competition for collection positions will be in large metropolitan banks that generally offer higher salaries and better opportunities for advancement than other employers.

The demand for collection workers will be spurred by the expansion of credit card services and the further growth of suburban retail stores. Delinquent accounts, unfortunately, are an unavoidable aspect of the credit system. As businesses extend attractive credit terms for the purchase of greater numbers of goods and services by increasingly broad segments of our society, the number of delinquent accounts can be expected to increase. Additional collection workers will be required to service these accounts on a person-to-person basis.

Earnings and Working Conditions

Although earnings and payment schedules for collectors vary among employers, the limited information available indicates that beginning collectors earned over $100 a week in 1974. Managers of collection departments often earned $15,000 a year and more.

A survey by the American Collectors Association showed that telephone collectors working for collection agencies had an average monthly income of $626 in 1974. This average income can vary substantially because collection agencies generally use some form of salary plus commission plan as an incentive to their collectors.

Commission schedules vary widely from agency to agency. A collector may be paid a relatively high salary with a low commission percentage or receive a low salary and a high rate on the money he collects for the agency. In some agencies, a quota is assigned to a collector or group of collectors and a bonus paid if the quota is reached. A few collection workers' earnings are only from commissions.

In addition to salary, collectors receive the benefits common to other office occupations, such as paid vacations and health insurance. Those who occasionally make visits outside the office usually are furnished a company car or are paid expenses for using their own automobile.

Sources of Additional Information

Information on jobs as collection workers as well as other positions in a credit collection office is available from:

American Collectors Association, 4040 W. 70th St., Minneapolis, Minn. 55435.

Associated Credit Bureaus, 6767 Southwest Freeway, Houston, Tex. 77036.

FILE CLERKS

(D.O.T. 132.388, 205.368, 206.388, 219.588, 920.887)

Nature of the Work

An orderly file system is often the key to an efficient office. In most offices, records are arranged so that information can be located quickly. This creates many job opportunities for file clerks, who keep records accurate, up to date, and properly placed.

File clerks classify, store, update, and retrieve office information on request. To do this, they read incoming material and put it in order for future use by means of some system, such as by number, letter of the alphabet, or subject matter. When these records are requested, file clerks locate them and turn them over to the borrower. They keep track of materials removed from the files and make sure that those given out are returned.

Some clerks operate mechanized files which rotate to bring the needed records to them. Others retrieve documents or spools of microfilm and place them in an electronic transmitter which displays the information on video terminals located elsewhere in the organization. Records also must be up-to-date in order to be useful. File clerks make sure that new information is added to existing files shortly after it is received.

From time to time, file clerks may destroy outdated file materials

or transfer them to inactive storage. They check files at regular intervals to insure that all items are correctly placed. Whenever data cannot be located, the file clerk searches for the missing records. As an organization's needs for information change, file clerks modify old filing systems or establish new ones.

In small offices, file clerks often type, sort mail, or operate duplicating machines. Those who work with automated filing systems may code and microfilm all incoming documents.

Places of Employment

About 275,000 persons—15 percent of them men—worked as file clerks in 1974. In addition, many other clerical workers perform some filing tasks in connection with their work. Opportunities for part-time work are abundant in this occupation; in 1974, approximately 1 of every 4 file clerks worked part time.

Although filing jobs are found in almost every kind of organization, over one-half of all file clerks work in banks, insurance companies, factories, or government agencies.

Training, Other Qualifications, and Advancement

Employers prefer high school graduates for beginning file clerks. Most seek applicants who can type, and many prefer those who have some knowledge of office practices as well. High schools, colleges, and private business schools teach these and other skills that help a beginner get a job. Many States and localities sponsor programs to train unemployed and low-skilled workers for entry level clerical jobs such as file clerk.

Some on-the-job training usually is necessary because each organization has its own filing system and office procedures. In organizations that have specialized filing procedures, clerks learn their jobs in a few weeks. Learning to operate mechanical filing systems usually takes more time. Where file clerks have a variety of related duties, training may take up to 3 months.

File clerks must read accurately and rapidly, spell well, and like detailed work. They should be neat, able to work as part of a team, and not be easily bored by repeated tasks.

File clerks can advance to more difficult filing duties and to jobs supervising other file clerks. Those who improve their skills may be promoted to office machine operators, receptionists, and typists.

Employment Outlook

Employment of file clerks is expected to grow about as fast as the average for all occupations through the mid-1980's as business expansion creates a need for more and better recordkeeping. In addition, a large number of file clerks will be needed each year to replace those who die, retire, or transfer to other jobs.

The growing volume of paper work and continued expansion of those businesses that traditionally have employed many file clerks should assure steady employment growth. However, this growth should be slower than in past years as computers are used more extensively to arrange, store, and transmit information. Jobseekers who possess typing and other secretarial skills and are familiar with a wide range of office machines should have greater opportunities than less experienced applicants.

Temporary or part-time work often is desirable for students and persons with family responsibilities. File clerks should find many such opportunities as employers increasingly turn to part-time and temporary workers during peak business periods.

Earnings and Working Conditions

According to a recent survey, beginning file clerks in urban areas averaged $107 a week in 1974. Those with some experience averaged $118; those with a great deal of experience, $144. File clerks earn almost three-fourths as much as the average for nonsupervisory workers in private industry, except farming.

In the Federal Government, beginning file clerks without high school diplomas started at about $102 a week in late 1974, and high school graduates began at $115 a week. Experienced file clerks in the Federal Government averaged about $152 a week in 1974.

Working conditions for file clerks usually are similar to those for other office workers in the same organization. Although they do not do heavy lifting, they often must stoop, bend, and reach. (See the statement on Clerical Occupations for information on fringe benefits and sources of additional information.)

HOTEL FRONT OFFICE CLERKS

(D.O.T. 242.368)

Nature of the Work

Hotels and motels employ front office clerks to handle room reservations, greet guests, issue keys, and collect payments. In small hotels and in many motels, front office clerks also may work as bookkeepers, cashiers, or telephone operators. Large hotels usually employ several front office clerks to handle different jobs, such as receiving mail, providing information, or issuing keys. In the largest hotels, floor clerks distribute mail, packages, and telegrams to guests. About 54,000 persons—half of them women—worked as front office clerks in 1974.

Room or *desk clerks* assign rooms to guests and answer questions about hotel services, checkout time, or parking facilities. In assigning rooms, they must consider guests' preferences while trying to maximize hotel revenues. These clerks fill out guests' registration forms and sometimes collect payments.

Reservation clerks record written or telephoned requests for rooms, type out registration forms, and notify room clerks of guests' arrival times.

Rack clerks keep records of room assignments to advise housekeepers, telephone operators, and maintenance workers that rooms are occupied.

Training, Other Qualifications, and Advancement

Employers usually select high school graduates who have some clerical aptitude when they are hiring front office clerks. A knowledge of bookkeeping is helpful for work in a small hotel or on the night shift, because clerks often have a wider range of duties under these circumstances. Occasionally, employees in other hotel occupations, such as bellhops or elevator operators, may be transferred to front office jobs.

Although education beyond high school generally is not required for front office work, college training is an asset for advancement to managerial jobs. Neatness, a courteous and friendly manner, and a desire to help people are important traits for front office clerks. Knowledge of a foreign language can be helpful for work in large hotels or resorts that receive many foreign guests.

Newly hired workers usually begin as mail, information, or key clerks and receive their training on the job. The training period is usually brief and includes an explanation of the job's duties and information about the hotel, such as room locations and services offered. Once on the job, they receive help and supervision from the assistant manager or an experienced front office worker.

Most hotels promote front office workers from within so that a key or mail clerk may be promoted to room clerk, then to assistant front office manager, and later to front office manager. Clerks may improve their opportunities for promotion by taking home study courses in hotel management such as those sponsored by the Educational Institute of the American Hotel and Motel Association. (See the statement on Hotel Managers and Assistants elsewhere in the *Handbook*.)

Front office clerks check the occupancy and advance reservation rack before accepting telephoned reservations or assigning rooms to arriving guests.

Employment Outlook

Employment of front office clerks is expected to grow about as fast as the average for all occupations through the mid-1980's as new hotels and motels are built. Most openings, however, will result from the need to replace workers who die, retire, or leave the occupation. Growth in the occupation will be limited somewhat by the use of

computerized reservation systems in most hotel and motel chains.

See the statement on the Hotel Industry elsewhere in the *Handbook* for information on earnings and working conditions, sources of additional information, and more information on employment outlook.

OFFICE MACHINE OPERATORS

(D.O.T. 207.782, .884, and .885; 208.782; 213.782; 214.488; 215.388; 216.488; and 234.)

Nature of the Work

To speed the paperwork involved in operating a business, most firms employ office machine operators to record information, determine bills and inventories, and perform other calculations. This statement decribes some of the more common machine operating jobs.

Billing machine operators (D.O.T. 214.488) prepare customer statements by typing information, such as customers' names, purchases, and amount of sales, on a billing machine that automatically computes the balances and required payments.

Bookkeeping machine operators (D.O.T. 215.388) record a firm's financial transactions on a bookkeeping machine and calculate trial balances, summary reports, and other necessary data.

Adding and calculating machine operators (D.O.T. 216.488) use mechanical adding machines and electronic calculators to compute payrolls and invoices and do other statistical work. Some calculators can also be used to compute square roots and percent distributions.

Mail preparing and mail handling machine operators (D.O.T. 234.) use machines to open incoming mail and prepare bills and letters for mailing. Some machines fold and insert enclosures, while others address, seal, and stamp envelopes. Addressing machines print addresses on envelopes using stencils or metal plates prepared by *embossing machine operators* (D.O.T. 208.782) using special typewriters.

Duplicating machine operators (D.O.T. 207.782, .884, and .885) operate equipment that can reproduce letters, bills, invoices and other documents. Included are mimeograph, stencil, and copying machines. These workers keep the machines loaded with paper, see that they are properly adjusted for the number of copies to be made, and may collate pages of lengthy documents by hand or machine.

Tabulating machine operators (D.O.T. 213.782) operate machines that sort and total large quantities of accounting and statistical information and print the results on special business forms.

Information about workers in several other occupations that use office machines can be found elsewhere in the *Handbook*, in the statements on computer and peripheral equipment operators, typists, and statistical clerks.

Places of Employment

In 1974, about 170,000 people—three-fourths of them women—worked as office machine operators. About one-third worked for manufacturing companies, but large numbers were employed by banks, insurance companies, government agencies, and wholesale and retail stores. Some office machine operators are employed by service firms that prepare monthly bills and mailing circulars for businesses that do not have their own office machinery.

Training, Other Qualifications, and Advancement

Employers prefer high school or

business school graduates for jobs as office machine operators. Most newly hired workers are expected to be able to type and operate adding machines and calculators. A knowledge of business arithmetic is helpful.

The amount of instruction and on-the-job training beginners receive depends on the types of machines they operate. Although a few days of training are usually sufficient to train duplicating machine operators, several weeks may be needed to train bookkeeping machine operators. Some office machine operators are trained at company expense in schools run by equipment manufacturers.

Finger dexterity, good eye and hand coordination, and good vision are important for most office machine operator jobs. Billing and calculating machine operators should know simple arithmetic so they can detect obvious errors in computations. Some mechanical ability is advantageous, especially for duplicating and tabulating machine operators.

Most employers promote from within and give strong consideration to seniority and job performance as shown by supervisors' ratings. Promotion may be from a routine machine job to a more complex one, or to a related clerical job. Employers often provide any additional training that may be required. In firms having large clerical staffs, office machine operators may advance to jobs where they train beginners or to supervisory positions as section or department heads.

Employment Outlook

Employment of office machine operators is expected to grow more slowly than the average for all occupations through the mid-1980's. Most openings will result from the need to replace workers who die, retire, or leave the occupation.

Despite expected growth in the volume of billing, computing, and duplicating work, the occupation will expand slowly as computerized recordkeeping and processing systems spread. In addition, advances in data transmission devices will enable large employers to centralize recordkeeping, and to reduce the requirements for operators in branch offices.

Earnings and Working Conditions

A 1974 Bureau of Labor Statistics survey of earnings for several office machine operator occupations in urban areas showed that the lowest salaries were paid in the South and the highest in the North and West.

For some occupations averages are given separately for different skill groups. Operators in Class A were very experienced and performed comparatively difficult work. Those in Classes B and C had some or no experience, worked on more routine assignments, and used simpler equipment. The average weekly salaries reported in this survey are shown in the accompanying tabulation:

	Average weekly salaries, 1974
Billing machine operators	$133.00
Bookkeeping machine operators:	
Class A	139.50
Class B	115.00
Tabulating machine operators:	
Class A	190.00
Class B	158.00
Class C	130.00

Billing and bookkeeping machine operators earned slightly less than the average for all nonsupervisory workers in private industry, except farming.

Because some types of office machines are very noisy, operators may work in special areas apart from other company offices. In other respects, their working conditions are similar to those of other office workers in the same firms. (See the statement on Clerical Occupations for further information on working conditions and for sources of additional information.)

POSTAL CLERKS

(D.O.T. 231.688, 232.138 and .368)

Nature of the Work

Most people are familiar with the post office window clerk who sits behind the counter selling stamps or accepting parcel post. However, the majority of postal clerks are distribution clerks who sort incoming and outgoing mail in workrooms. Only in a small post office does a clerk do both kinds of work.

When mail arrives at the post office, machines, operated by distribution clerks and mail handlers, separate it into groups of letters, parcel post, and magazines and newspapers. Clerks feed letters into stamp-canceling machines and cancel the rest by hand. The mail is then taken to other sections of the post office to be sorted by destination. Clerks first separate the mail into primary destination categories: mail for the local area, for each nearby State, for groups of distant States, and for some of the largest cities. This primary distribution is followed by one or more secondary distributions. For example, local mail is combined with mail coming in from other cities, and sorted according to street and number. In post offices with electronic mail-sorting machines, clerks read ZIP codes and simply push a key corresponding to the letter's destination; the letter drops into the proper slot.

The clerks at post office windows provide a variety of services in addition to selling stamps and money orders. They weigh packages to determine postage and check to see if their condition is satisfactory for mailing. Clerks also register and insure mail and answer questions

about postage rates, mailing restrictions, and other postal matters. Occasionally they may help a customer file a claim for a damaged package. In large post offices, a window clerk may provide only one or two of these services and may be called a registry, stamp, or money order clerk.

Training, Other Qualifications, and Advancement

Postal clerks must be at least 18 and pass a four-part written examination. The first part tests clerical accuracy by asking the applicant to compare pairs of addresses and indicate which are identical. The second part tests ability to memorize mail distribution systems. The third measures reading ability, including vocabulary, and the fourth tests ability to do simple arithmetic. They must also pass a physical examination and may be asked to show that they can lift and handle mail sacks weighing up to 70 pounds. Applicants who are to work with an electronic sorting machine must pass a special examination which includes a machine aptitude test.

Applicants should apply at the post office where they wish to work because each post office keeps a separate list of those who have passed the examination. Applicants' names are listed in order of their scores. Five extra points are added to the score of an honorably discharged veteran, and 10 extra points to the score of a veteran wounded in combat or disabled. Disabled veterans who have a compensable, service-connected disability of 10 percent or more are placed at the top of the list. When a vacancy occurs, the appointing officer chooses one of the top three applicants; the rest of the names remain on the list for future appointments.

New clerks are trained on the job. Most clerks begin with simple tasks to learn regional groupings of States, cities, and ZIP codes. To help clerks learn these groups, many post offices offer classroom instruction.

A good memory, good coordination, and the ability to read rapidly and accurately are important. Distribution clerks work closely with other clerks, frequently under the tension and strain of meeting mailing deadlines. Window clerks must be tactful when dealing with the public, especially when answering questions or receiving complaints.

Postal clerks are classified as casual, part-time flexible, part-time regular, or full time. Casual workers are hired to help handle the large amounts of mail during the Christmas season. Part-time flexible employees do not have a regular work schedule, but replace absent workers or help with extra work loads as the need arises. Part-time regular workers have a set work schedule—for example, 4 hours a day.

Most clerks begin as part-time flexible employees and become full-time workers as vacancies occur. As their seniority increases, they may bid for preferred assignments such as the day shift, a window job, or a higher level nonsupervisory position as expediter or window service technician. A relatively small number of clerks become supervisors.

Most postal clerks sort incoming and outgoing mail.

Employment Outlook

Employment of postal clerks—who numbered 268,000 in 1974—is expected to change very little through the mid-1980's. Although the amount of mail may increase along with population and business growth, modernization of post offices and installation of new equipment will increase the amount of mail each clerk can handle. Most

job openings will result from the need to replace clerks who retire, die, or transfer to other occupations.

Earnings and Working Conditions

Most clerks are at the grade 5 level; in mid-1974 those working a part-time flexible schedule began at $4.77 and could reach $6.06 an hour after 8 years. By comparison, nonsupervisory workers in private industry, except farming, averaged $4.22 an hour. Clerks working full time earned $9,588 a year and could advance to $12,173 after 8 years. All clerks who work night shifts receive 10 percent additional pay.

Besides good pay, full-time postal employees have more job security than workers in most other industries.

Working conditions of clerks differ according to the specific work assignments and the amount and kind of laborsaving machinery in the post office. In small post offices, clerks may carry heavy mail sacks from one part of the building to another, and sort the mail by hand. In large post offices, chutes and conveyors move the mail and much of the sorting is done by machine. In either case, clerks are on their feet most of the time, reaching for sacks of mail and placing packages and bundles into sacks while walking around the workroom.

Distribution clerks may become bored with the routine of sorting mail unless they enjoy trying to improve their speed and accuracy. They also may have to work at night, because most large post offices process mail around the clock.

A window clerk, on the other hand, has a greater variety of duties, has frequent contact with the public, generally has a less strenuous job, and never has to work a night shift.

(For information on fringe benefits, see statement on Postal Service Occupations elsewhere in the *Handbook*.)

Sources of Additional Information

Local post offices and State employment service offices can supply details about entrance examinations and employment opportunities for postal clerks.

Clerk unloads mail from truck.

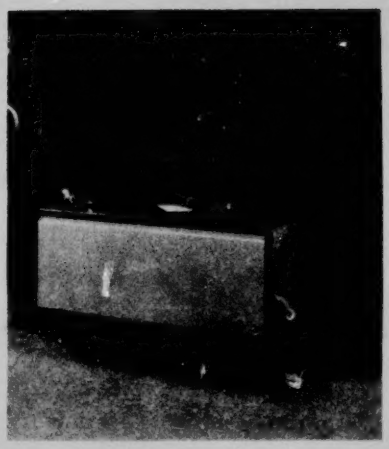
RECEPTIONISTS

(D.O.T. 235.862, 237.368)

Nature of the Work

All organizations want to make a good first impression on the public. This is an important part of the job of the receptionist, who generally is the first person a caller sees.

Receptionists greet customers and other visitors, determine their needs, and refer callers to the official who can help them. Receptionists in hospitals, after obtaining personal histories, direct patients to the proper waiting rooms; in beauty shops, they arrange appointments and show customers to the operator's booth; and in large plants, they provide callers with identification cards and arrange escorts to take them to the proper office.



Many receptionists keep business records of callers, the times at which they called, and the persons to whom they were referred. When they are not busy with callers, receptionists may type, file, or operate a switchboard. Some receptionists open and sort mail and collect and distribute messages. Still others prepare travel vouchers and do simple bookkeeping.

Places of Employment

Nearly 460,000 persons worked as receptionists in 1974. Ninety-seven percent of them were women. Part-time employment is readily available for receptionists, and about 1 in 3 works part time.

Although receptionists work in almost every kind of organization, over half work for doctors, lawyers, or other professional people. Large numbers also work in insurance companies, banks, factories, and firms providing business and personal services.

Training, Other Qualifications, and Advancement

A high school diploma generally is required for work as a receptionist. Courses in English, spelling, typing, elementary bookkeeping,

and business practices are helpful to the beginner.

Liking people and wanting to help them are assets to the receptionist. A neat appearance, a pleasant voice, and an even disposition also are important. Because receptionists do not work under close supervision, common sense and a thorough understanding of how the business is organized help them handle various situations that arise.

Promotion opportunities for receptionists are limited, especially in small offices. In large workplaces, however, a receptionist who has clerical skills may advance to a better paying job as a secretary or administrative assistant. Many companies have their own training programs so that the skills needed for advancement can be learned on the job. College or business school training also can be helpful in advancing to better paying office jobs.

Employment Outlook

Employment of receptionists is expected to grow faster than the average for all occupations during the next 10 years. Thousands of openings will result each year as businesses expand and as receptionists who die, retire, or transfer to other jobs are replaced. The number of replacements will be quite large because the occupation is large and turnover is high.

Within the fast-growing clerical field, receptionist employment is expected to grow very rapidly. Only a few other clerical jobs are projected to grow faster through 1985. This is largely because so many receptionists work for firms providing business, personal, and professional services—a sector of the economy which is expected to show very strong growth in the future. In addition, more and more firms recognize the importance of the receptionist in promoting good public relations. Also, because the receptionist's work is of a person-to-person nature, it is unlikely to be affected by office automation.

Job opportunities should continue to be excellent for students, persons with family responsibilities, and others who do not wish to work full time.

Earnings and Working Conditions

Full-time switchboard/receptionists working in urban areas averaged $113 a week in 1974. This was slightly under the average earnings for nonsupervisory workers in private industry, except farming. Receptionists working in the western United States had average weekly earnings of $118. Those in southern cities averaged $105 a week. In the Federal Government, beginning information receptionists earned $115 a week in late 1974.

Receptionists usually work in areas that are comfortably furnished. Although most have regular hours, receptionists in hospitals and beauty shops may work evenings and weekends. (See the statement on Clerical Occupations for sources of additional information.)

SECRETARIES AND STENOGRAPHERS

(D.O.T. 201.268 and .368; 202.388, and 209.138)

Nature of the Work

The efficiency of any organization depends upon *secretaries* and *stenographers* who are at the center of communications within their firm. They transmit information among their employer's staff and to persons in many other organizations.

Secretaries (D.O.T. 201.368) relieve their employers of routine duties so that they can work on more important matters. Although most secretaries type, take shorthand, and deal with callers, the time spent

on these duties varies in different types of organizations.

In offices where dictation and typing are handled in word processing centers, *administrative secretaries* handle all other secretarial duties. (For more information on these centers, see the statement on Typists elsewhere in the *Handbook*.) They often work in clusters of three or four so that they can readily help each other. Because they are released from dictation and typing, they can serve several members of the professional staff. Their duties range from filing, routing mail, and answering telephones to more responsible jobs such as answering letters, doing statistical research, and writing reports.

Some secretaries are trained in specific skills needed in certain types of work. *Medical secretaries* prepare case histories and medical reports; *legal secretaries* do legal research and help prepare briefs; and *technical secretaries* assist engineers or scientists in drafting reports and research proposals. Another specialized secretary is the *social secretary* (D.O.T. 201.268), who arranges social functions, answers personal correspondence, and keeps the employer informed about all social activities.

Stenographers (D.O.T. 202.388) take dictation and then transcribe their notes on a typewriter. They may either take shorthand or use a stenotype machine which prints

symbols as certain keys are pressed. *General stenographers*, including most beginners, take routine dictation and do other office tasks such as typing, filing, answering telephones, and operating office machines. Experienced and highly skilled stenographers take difficult dictation and do more responsible clerical work. They may sit in on staff meetings and give a summary report or a word for word record of the proceedings. They also supervise other stenographers, typists, and clerical workers. *Technical stenographers* must know the terms used in a particular profession. They include medical, legal, and engineering or scientific stenographers. Some experienced stenographers take dictation in foreign languages; others work as public stenographers serving traveling business people and others.

Shorthand reporters are specialized stenographers who record all statements made in a proceeding. Nearly half of all shorthand reporters work as *court reporters* attached to courts of law at different levels of government. They take down all statements made at legal proceedings and present their record as the official transcript. Many other shorthand reporters work as *free-lance reporters* who record out-of-court testimony for attorneys, meetings and conventions, and other private activities. Still others record the proceedings in the Congress of the United States, in State legislatures, and in both State and Federal agencies.

Most shorthand reporters take their notes on a stenotype machine and transcribe them on a typewriter. Sometimes the reporter dictates notes on magnetic tapes that a typist can transcribe later. Because the reporter's transcript is the official record of a proceeding, accuracy is vitally important.

Places of Employment

About 3.3 million persons—nearly all of them women—worked in jobs requiring secretarial or stenographic skills in 1974; most were secretaries. Despite impressive employment gains in non-traditional occupations, more women work as secretaries than in any other job. Only about 100,000 persons worked as stenographers in 1974.

Opportunities for part-time work are increasing in these and other clerical occupations. In 1974, approximately 1 of every 5 secretaries and 1 in 6 stenographers worked part time.

Secretaries and stenographers are employed throughout the economy. About two-thirds of them, however, work in banks, insurance companies, real estate firms, government agencies, and other establishments providing services to the public. Most specialized stenographers and secretaries work for doctors, lawyers, and other professional people.

Training, Other Qualifications, and Advancement

Generally, graduation from high school is required for a job as a secretary or stenographer. Many employers prefer applicants having additional secretarial training at a college or private business school. Courses vary from a few months' instruction in basic shorthand and typing to longer programs teaching specialized skills such as shorthand reporting or legal or medical secretarial work. Shorthand reporters generally must complete a 2-year course in a shorthand reporting school.

An increasing number of private firms and government agencies have their own training facilities where employees can upgrade their skills and broaden their knowledge of the organization. Also, many State and local governments sponsor programs to train unemployed and low-skilled workers for entry jobs as secretaries.

Many courts of law require their court reporter to be a Certified Shorthand Reporter (CSR). Others hire reporters with the understanding that they will be certified within 1 year. The National Shorthand Reporters Association gives tests for speed and accuracy to certify reporters.

Although there are many different shorthand methods, employers usually have no preferences. The most important factor in hiring and promotion is speed and accuracy. To qualify for jobs in the Federal Service—and for employment in many private firms—stenographers must be able to take dictation at 110 words per minute and type 40 to 50 words per minute. Many shorthand reporting jobs require more than 225 words of dictation per minute; shorthand reporters in the Federal Government generally must take 175 words a minute.

Secretaries and stenographers should have good hearing; a knowledge of spelling, punctuation, grammar, and vocabulary is essential. The ability to concentrate amid distractions is vital for shorthand reporters. Employers look for persons who are poised and alert, and who have pleasant personalities. Discretion, judgment, and initiative are important for the more responsible secretarial positions.

Many stenographers who improve their skills advance to secretarial jobs; others, who acquire the necessary speed through additional training, can become shorthand reporters. Secretaries can increase their skills and broaden their knowledge of their company's operations by taking courses offered by the company or by local colleges and universities. As secretaries gain knowledge and experience, they can qualify for the designation Certified Professional Secretary (C.P.S.) by passing a series of exams given by the National Secretaries Association. This designation is recognized by a growing number of employers as

the mark of achievement in the secretarial field. Many executive secretaries are promoted into management positions where they can use their vast experience and knowledge of their employer's operations.

Employment Outlook

Employment of secretaries is expected to increase faster than the average for all occupations through the mid-1980's as the continued expansion of business and government creates a growing volume of paper work. Several hundred thousand jobs will become available each year due to growth and the need to replace those who die, retire, or stop working for other reasons.

Demand for secretaries will rise mainly as those organizations which require large secretarial staffs expand their operations. New or expanded government agencies, particularly at the State and local level; insurance companies offering new forms of protection; and banks providing financial counseling for an increasingly affluent population all underscore the need for well-trained and versatile secretaries. Although many new types of automatic office equipment have been introduced in recent years, no adverse impact on employment of secretaries is expected. However, job seekers who are familiar with a wide range of office machines and procedures should have better prospects than less experienced workers.

Persons with secretarial skills should find extensive opportunities for temporary or part-time work as employers increasingly turn to these workers during peak business periods. This type of arrangement should be especially attractive to students and persons with family responsibilities.

Employment of stenographers is expected to continue the decline of recent years. The increased use of dictation machines has severely reduced the need for office stenographers, and fewer jobs will be available than in the past. Prospects for skilled shorthand reporters, in contrast to the overall outlook for stenographers, appear to be very good as State and Federal court systems expand to handle the rising number of criminal court cases and civil lawsuits. Opportunities will be best for those who have earned certification by the National Shorthand Reporters Association.

Earnings and Working Conditions

According to a recent survey, general stenographers working in urban areas averaged $586 a month in 1974; experienced workers who were highly skilled averaged $663. Shorthand reporters generally earn higher salaries than other stenographic workers. The National Shorthand Reporters Association estimates that well-trained beginners receive from $800 to $1,000 a month, depending on speed and regional location.

According to the same survey, secretaries to supervisors in small offices earned monthly salaries of $638. Secretaries to officers in small companies had average monthly salaries of $690; those working for middle management in large companies averaged $735. Secretaries having greater responsibilities, such as executive secretaries to corporate officers, earned average monthly salaries of $804.

Beginning clerk-stenographers in the Federal Government earned from $499 to $708 a month in late 1974 depending on education, training and experience. Earnings of beginning shorthand reporters ranged from $789 to $1,070 a month depending on speed, education, and experience. Starting salaries for secretaries in the Federal Government ranged from $708 to $876 a month, while the average for all secretaries was $840 a month. In 1974, earnings of stenographers were slightly less and those of secretaries somewhat more than average earnings for all nonsupervisory workers in private industry, except farming.

Working conditions for secretaries and stenographers generally are similar to those of other office workers in the same organization. Shorthand reporters, however, often sit for long periods of time while recording an event. (See the statement on Clerical Occupations for more information on earnings and working conditions.)

Sources of Additional Information

For information on careers in secretarial work, write:

National Secretaries Association (International), 2440 Pershing Road, Suite G10, Kansas City, Missouri 64108.

Additional information on careers in secretarial work and a directory of business schools is available from:

Association of Independent Colleges and Schools, 1730 M St. NW., Washington, D.C. 20036.

For information about shorthand reporting, contact:

National Shorthand Reporters Association, 25 West Main St., Madison, Wis. 53703.

SHIPPING AND RECEIVING CLERKS

(D.O.T. 209.688, 219.388, 222.138 through .687, 223.387, 239.588, 910.368 and 920.887)

Nature of the Work

Shipping and receiving clerks keep track of goods transferred between firms and their customers and suppliers. In small companies, one clerk may keep records of all shipments sent out and received; in larger companies, many clerks take care of this recordkeeping.

Shipping clerks are responsible for all shipments leaving a business place. Before goods are sent to a customer, these clerks check to be sure the order has been filled correctly. They obtain merchandise from the stockroom and wrap it or pack it in shipping containers. Clerks also put addresses and other identifying information on packages, look up and compute either freight or postal rates, and record the weight and cost of each shipment. They may also be responsible for preparing invoices and furnishing information about shipments to other parts of the company, such as the accounting department. Once a shipment is checked and ready to go, shipping clerks may move it to the shipping dock and direct its loading on trucks according to its destination. Shipping and receiving clerks working in small firms may combine the various duties of stock clerks in their jobs. (For more information about the additional duties of shipping clerks in small firms, see the statement on Stock Clerks elsewhere in the *Handbook*.)

When shipments arrive, receiving clerks perform tasks similar to shipping clerks. They determine whether their employer's orders have been correctly filled, by verifying incoming shipments against the original order and the accompanying bill of lading or invoice. They record the receipt and condition of incoming shipments. Clerks also make adjustments with shippers for lost and damaged merchandise. Routing or moving shipments to the proper department, warehouse section, or stockroom, and providing information that is needed to compute inventories also may be part of their job.

Places of Employment

About 465,000 persons—one quarter of them women—worked as shipping and receiving clerks in 1974. More than half worked in

factories; large numbers also were employed by wholesale houses or retail stores. Although jobs for shipping and receiving clerks are found in all localities, most clerks work in urban areas, where many factories and wholesale houses are located.

Training, Other Qualifications, and Advancement

High school graduates are preferred for beginning jobs in shipping and receiving departments. Business arithmetic, typing, and other high school business subjects are helpful. The ability to write legibly is important. Dependability and an interest in learning about the firm's products and business activities also are qualities which employers seek. In addition, shipping and receiving clerks should be able to work under close supervision at repetitive tasks.

New employees usually are trained on the job by an experienced worker. As part of their training they often file, check addresses, attach labels, and check items included in shipments. As clerks gain experience, they may be assigned tasks requiring a good deal of independent judgment, such as handling problems of damaged merchandise, or supervising other workers in shipping or receiving rooms.

Work as a shipping or receiving clerk offers a good opportunity for ambitious young people to learn about their company's products and business practices. Some clerks may be promoted to head shipping or receiving clerk or warehouse manager. Others may enter related fields such as industrial traffic management or purchasing. (Industrial Traffic Managers and Purchasing Agents are discussed elsewhere in the *Handbook*.)

Employment Outlook

Employment of shipping and receiving clerks is expected to rise about as fast as the average for all occupations through the mid-1980's as business expands and there are more goods to be distributed. Several thousand jobs will become available each year as employment grows and as workers retire, die, or transfer to other occupations.

Although substantial growth is expected in the volume of goods to be moved, employment of shipping and receiving clerks will increase rather slowly because of changes in technology which enable fewer clerks to handle more goods. Growing numbers of firms are using computers to keep track of shipping and receiving records, and moving belts to handle shipments once lifted by hand.

Earnings and Working Conditions

Shipping and receiving clerks in urban areas averaged $169 a week, according to a 1974 survey. This is about as much as the average earnings for all nonsupervisory workers in private industry, except farming. Salaries varied substantially, however, by type of employer. Shipping and receiving clerks employed by manufacturing firms averaged $166, those working

for wholesale houses earned $175, and those employed by public utilities averaged $198.

Most shipping and receiving clerks receive time-and-a-half for work over 40 hours. Night work and overtime, including work on Saturdays, Sundays, and holidays, may be necessary when shipments have been unduly delayed or when materials are needed immediately on production lines. Although shipping and receiving clerks do much of their work in warehouses or in shipping and receiving rooms, they may do some of it on outside loading platforms. Workplaces often are large, unpartitioned areas which may be drafty, cold, and littered with packing materials.

Most clerks must stand for long periods while they check merchandise. Locating numbers and descriptions on cartons often requires a great deal of bending, stooping, and stretching. Also, under the pressure of getting shipments moved on time, clerks sometimes may help load or unload materials in the warehouse. (See the statement on Clerical Occupations for additional information on fringe benefits.)

Sources of Additional Information

Information about the work and earnings of shipping and receiving clerks in wholesale establishments is available from:

National Association of Wholesaler Distributors, 1725 K St. NW., Washington, D.C. 20006.

STATISTICAL CLERKS

(D.O.T. 205.368, 206.588, 209.588, 219.388, .488, .588, 222.687, 223.588, 913.368, and 953.168)

Nature of the Work

Administrators and managers in all types of organizations depend on numerical records to help make decisions. Statistical clerks prepare and insure the accuracy of these records. Jobs in this field can be grouped into four categories: recording, compiling and coding, computing and tabulating, and scheduling.

Recording. This work involves collecting and verifying the accuracy of information. *Shipping checkers* in manufacturing companies and wholesale and retail businesses (D.O.T. 222.687) insure that merchandise is ready for shipment, is properly labeled, and contains the desired number of items. *Car checkers* for railroads (D.O.T. 209.588) record shipments as they arrive at or leave a freight terminal. They check railroad car numbers and contents to verify specifications on the invoice. *Counters* (D.O.T. 223.588), who may have a title specifying their work or the items which they count, record the number of materials received, transferred, or produced, and work in several industries. For example, lumber talliers or lumber checkers work in saw mills; pit recorders collect production data in the steel industry.

Compiling and coding. In organizations of all types, information must be properly filed, verified, or analyzed by data processing equipment. *Posting clerks* (D.O.T. 219.588) do this work by making entries in registers and journals. They receive and sort records of shipments, production, and financial transactions to provide company officials with current information on business activities. *Recordkeepers* (D.O.T. 206.588), also known as classification clerks, record data systematically for easy location. *Coding clerks* (D.O.T. 219.388) code information for transfer to computer cards. *Personnel clerks* (D.O.T. 205.368) gather and file information on the employees of a business; their work may include some typing and preparation of reports.

Computing and tabulating. Organizations frequently use numerical records for reports and research. Statistical clerks gather information from records to present in a chart or table for analysis. *Actuary clerks* (D.O.T. 219.388) assist actuaries in insurance companies to determine the risk involved in providing insurance coverage. They also prepare charts and tables for studies on general insurance practices. *Policy checkers* (D.O.T. 219.488) verify insurance company records. *Statistical assistants* (D.O.T. 219.388), also known as tabulating clerks, calculate and compute numerical data for government and business research projects. *Demurrage clerks* (D.O.T. 219.388), employed by railroads, compute charges for the use of railroad tracks and calculate the weight of shipments or distance railroad cars have traveled.

Scheduling. Many business activities involve the movement of people and things, and statistical clerks do much of the required scheduling. For example, *assignment clerks* (D.O.T. 913.368) work for bus companies and assign drivers to meet riders' transportation needs. Drivers are selected on the basis of experience, length of service, and nature of the assignment. *Crew schedulers* (D.O.T. 219.388) do similar work for airlines; they assign pilots to scheduled flights and log the mileage each pilot has flown. *Gas dispatchers* (D.O.T. 953.168) determine the proper pressure in a natural gasline to meet customers' requirements after considering information such as the weather, time of day, and other factors that affect the use of gas.

Places of Employment

Over 225,000 persons worked as statistical clerks in 1974. More than two-thirds were women, but some jobs were held predominantly by men. For example, shipping checkers, who may lift and move

heavy items, and assignment clerks, who normally are experienced bus drivers, usually are men.

Although statistical clerks are employed in nearly every industry, over half worked in finance, insurance, and real estate companies; manufacturing firms; and Federal, State, and local government.

Because businesses of almost every size require numerical records, statistical clerks work throughout the United States. Jobs are concentrated, however, in heavily populated cities that are centers of industry and government activities.

Training, Other Qualifications, and Advancement

Most employers prefer statistical clerks who are high school graduates. They also seek applicants who have an aptitude for working with numbers and the ability to do detailed work. Clerks should be tactful and even tempered. Courses in business arithmetic, bookkeeping, and typing are good preparation for this work.

In many companies, general clerks who have become familiar with their employers' record systems and office procedures are promoted to statistical clerk positions. On-the-job training that equips the employee to specialize in numerical work may include the use of calculators, tabulating machines, and typewriters.

Statistical clerks who observe and record data must be familiar with the items or information which they observe. For example, lumber checkers must know the various types and qualities of wood products. Statistical clerks in compiling and coding jobs must locate and assemble information from records in an orderly manner. In preparing data for computers, coding clerks must be careful to avoid errors.

Most employers follow a promotion-from-within policy that allows experienced workers to qualify for more responsible jobs as they become available. Qualified statistical clerks may perform more difficult assignments or advance to supervisory positions. Many compiling and coding jobs and computing and tabulating jobs can lead the exceptional employee with specialized training to a career in computer programming and related work.

Employment Outlook

Employment of statistical clerks is expected to grow about as fast as the average for other occupations through the mid-1980's. In addition to job opportunities arising from this growth, many additional openings will occur as clerks die, retire, or leave the occupation for other reasons.

This occupation includes a wide range of jobs. Some statistical clerks perform routine duties and there may be fewer such jobs in the future as computers increasingly are used to collect and process information. Other jobs will not be eliminated by the computer because they require personal contact or involve preparing data for computer use. The demand for these workers should outpace the growth of the occupation as a whole.

Among the factors that will contribute to the demand for statistical clerks is the expected increase in business and government projects requiring the collection and processing of large amounts of numerical data. In addition, administrators increasingly will rely on numerical records to analyze and control all aspects of their organization's work.

Earnings and Working Conditions

Limited information indicates that beginning statistical clerks earn about as much as workers in other entry level clerical jobs such as office clerks or file clerks; salaries for these workers ranged between $90 and $100 a week in 1974. The entrance salary for beginning statistical assistants employed by the Federal Government was $130 a week in late 1974.

Experienced workers doing statistically related clerical work, including the operation of tabulating machines or calculators, earned between $120 and $150 a week in 1974. Top level clerks and supervisors earned $175 a week and more. Earnings usually are highest in the manufacturing, transportation, and utilities industries; and lower in retail trade; finance, insurance and real estate; and service industries.

Nearly every employer of statistical clerks offers some form of health plan, life insurance coverage, and retirement benefits. Most statistical clerks work in clean, well-lighted and well-ventilated offices.

STOCK CLERKS

(D.O.T. 223.138, .368, .387, .388, .588, .687; 910.388; 969.387)

Nature of the Work

Most employers recognize the importance of keeping well-balanced inventories to prevent sales losses or slowdowns in production.

Stock clerks (D.O.T. 223.387) help protect against such losses by controlling the flow of goods received, stored, and issued. They usually receive and unpack incoming merchandise or material. They may check the items against outgoing orders for quality and quantity and sometimes make minor repairs or adjustments. They also report damaged or spoiled goods and process papers necessary for obtaining replacements or credit.

Materials are stored in bins, on the floor, or on shelves according to the plan of the stockroom. Stock clerks organize and mark items with identifying codes or prices so that inventories can be located quickly and easily. They keep records of items entering or leaving the stockroom. Sometimes they label, pack, crate, or address goods for delivery.

Stock clerks working in small firms may combine the varied duties of shipping and receiving clerks. (For more information about the additional duties of stock clerks in small firms, see the statement on Shipping and Receiving Clerks elsewhere in the *Handbook*.) In large firms with specialized jobs, *inventory clerks* (D.O.T. 223.388) take periodic counts of items on hand and make reports showing stock balances. *Procurement clerks* (D.O.T. 223.368) work in factories and prepare orders for the purchase of new equipment.

The duties of stock clerks also depend on the items they handle. For example, stock clerks who work with foods and drugs must maintain proper temperature and humidity conditions; those who handle large construction items must do much walking and climbing to note the condition and quantity of that stock.

Places of Employment

Nearly 490,000 persons—one-fourth of them women—worked as stock clerks in 1974. About two-thirds of the total worked in factories, wholesale firms, and retail stores. Many others were employed by airlines, government agencies, hospitals, and other organizations that keep large quantities of goods on hand. Although jobs for stock clerks are found in all parts of the country, most work in urban areas

where factories, warehouses, and stores are concentrated.

Training, Other Qualifications, and Advancement

Although there are no specific educational requirements for stock clerks, employers prefer high school graduates. Many look for reading and writing skills, a basic knowledge of mathematics, and typing and filing abilities. Good health, especially good eyesight, is important. Generally, those who handle jewelry, liquor, or drugs must be bonded.

Stock clerks usually receive on-the-job training. New workers begin with simple tasks such as counting and marking stock. Basic responsibilities of the job usually are learned within several weeks. As they progress, stock clerks learn to keep records of incoming and outgoing materials, take inventories, and order supplies.

This is a job where many young people start their careers. In a small firm, the stock clerk may advance to a sales position or become an assistant buyer or purchasing agent. In large firms, stock clerks can advance to more responsible stock handling jobs such as invoice clerk, stock control clerk, or procurement clerk. A few may be promoted to the stockroom supervisor's job, but additional education often is required.

Employment Outlook

Employment of stock clerks is expected to increase about as fast as the average for all occupations through the mid-1980's. Many thousands of job openings will occur each year as employment grows and as workers die, retire, or transfer to other occupations.

Growth in employment of stock clerks probably will be slower than in the past as computers are used increasingly for inventory control. Because entrance into this occupation is relatively easy and many young people seek this work as a first job, some competition for openings is likely.

Earnings and Working Conditions

Experienced stock clerks earned average weekly salaries of $166 in 1974, according to the limited data available. This was slightly above the average for nonsupervisory workers in private industry, except farming.

In the Federal Government, beginning stock clerks without experience were paid $115 a week in late 1974; those with general work experience received $130 a week. Experienced stock clerks in the Federal Government averaged about $180 a week in 1974.

Stock clerks generally receive time-and-a-half for work over 40 hours. Overtime may be required when large shipments are delivered and when inventory is taken.

Although stock clerks usually work in relatively clean, heated, and well-lighted areas, some stockrooms may be damp and drafty. Clerks handling refrigerated goods may spend some time in cold storage rooms. Stock clerks are on their feet much of the working day, often on a concrete floor. The job also involves considerable bending, lifting, and climbing. (See the statement on Clerical Occupations for additional information on working conditions and fringe benefits.)

Sources of Additional Information

Information about the work and earnings of stock clerks in wholesale establishments is available from:

National Association of Wholesaler Distributors, 1725 K St. NW., Washington, D.C. 20006.

TYPISTS

(D.O.T. 203.138 through .588; 208.588; and 209.382 through .588)

Nature of the Work

A rapid flow of written communication is essential to the modern office. The typist helps to maintain this flow by making neat, typed copies of handwritten, printed, and recorded words.

Beginning or *junior typists* usually type headings on form letters, copy directly from handwritten drafts, and address envelopes. Often, they do other office tasks, including answering telephones, filing, and operating office machines such as copiers and calculators.

More experienced typists do work that requires a high degree of accuracy and independent judgment. *Senior typists* work from rough drafts which are difficult to read or which contain technical material. They may plan and type complicated statistical tables, combine and rearrange materials from different sources, or prepare master copies to be reproduced on copying machines.

Clerk typists (D.O.T. 209.388) combine typing with filing, sorting mail, answering telephones, and other general office work. *Varitypists* (D.O.T. 203.582) produce master copies, such as stencils, on machines similar to typewriters.

Transcribing machine operators (D.O.T. 208.588) type letters and reports as they listen to dictation recorded on magnetic tape. Other typists who have special duties include *policy writers* (D.O.T. 203.588) in insurance companies, *waybill clerks* (D.O.T. 209.588) in railroad offices, and *mortgage clerks* (D.O.T. 203.588) who work in banks.

In some offices, many typists are grouped in a specialized word processing center that handles all the transcription and typing for

Typists operating high-speed equipment.

several departments. These workers, usually called *correspondence secretaries*, operate various kinds of high-speed typewriters equipped with a programmed memory which enables them to produce final copy with a minimum of retyping.

Places of Employment

About 1 million persons worked as typists in 1974. Ninety-seven percent of them were women. Despite recent gains in other fields, employment of women remains highly concentrated in clerical occupations, and typist is one of the largest of these. In addition to the 1 million typists, many other workers—including secretaries, newspaper reporters, writers, and editors—use typing skills in the performance of their jobs.

Part-time employment is readily available for workers with clerical skills, and nearly 1 typist out of 4 works part time.

Typists are employed throughout the entire economy. Over half of them work in factories, banks, insurance companies, real estate firms, and government agencies. The largest single concentration of typists is found in Federal, State, and local government agencies where the volume of paperwork to be processed is extremely high.

Training, Other Qualifications, and Advancement

Typists generally need high school diplomas. Good spelling, punctuation, and grammar are essential. Ability to operate office equipment, such as copying and adding machines, and also a knowledge of office procedures, are assets.

An increasing number of companies and government organizations have their own typist training programs. These give employees a chance to learn or upgrade skills so that they can advance to more responsible positions within the organization. Many States and localities sponsor programs to train unemployed and low-skilled workers for entry jobs as typists.

Many employers require applicants for typing jobs to take a test that shows their speed and accuracy. For most jobs, 40 to 50 words per minute is required. All typists who transcribe recorded dictation need sharp hearing and must be especially good in spelling. Successful typists are neat, accurate, and are able to concentrate amid distractions.

As beginners increase their skills, they often advance to higher level typing jobs. Some typists are promoted to supervisor jobs in word processing centers. Others, who master additional skills, can move into secretarial jobs.

Employment Outlook

The number of typists is expected to grow faster than the average for all occupations through the mid-1980's as business expansion increases the volume of paperwork. Many thousands of job openings will occur each year due to growth of the occupation and the need to replace those who die, retire, or leave the labor force.

Continued growth of the economy, particularly those industries that generate vast quantities of written records and correspondence, will assure very good prospects for typists in the years ahead. Demand should be particularly strong for highly skilled workers and those who can handle other office jobs as well as typing. Many employers will prefer typists who are familiar with new kinds of word processing equipment. Because an increasing number of employers are using temporary and part-time workers during peak business periods, opportunities should continue to be excel-

lent for typists who do not wish to work full time.

Earnings and Working Conditions

According to a recent survey, beginning typists averaged $122 a week in 1974. Those with experience earned $141 a week, slightly less than the average earnings for nonsupervisory workers in private industry, except farming.

In the Federal Government, the starting salary for typists without experience was $115 a week in late 1974, compared with $146 a week for those with experience.

Working conditions for typists usually are similar to those of other office employees. Typists, like other clerical workers, sit for periods of time and often must contend with high noise levels caused by office machines located nearby. (See the statement on Clerical Occupations for more information on working conditions and also for a list of places to write for additional information on clerical jobs.)

COMPUTER AND RELATED OCCUPATIONS

Since 1951, when the first computer was installed for commercial use, computer systems have become an increasingly important part of everyday life. Today these machines bill customers, pay employees, record airline and hotel reservations, and monitor factory production processes. Scientific and engineering research relies on computer systems to solve complex equations as well as to collect, store, and sort vast amounts of data.

Workers in computer and related occupations design data processing systems, write instructions and translate data into machine-readable language, and operate computers and peripheral equipment.

Most computer careers require some type of specialized training. Although not a universal requirement, a college degree is increasingly important for systems analysts and programmers—especially for those who work in scientific and technical research operations. Computer operators usually need a high school diploma, but specialized training and experience are more important than formal education. For all computer occupations, employers stress the importance of learning on the job.

In addition to technical knowledge and skills, computer personnel must be able to concentrate on their work and should enjoy working with details. Those who operate equipment, keypunchers or console operators, for example, must have manual dexterity and some mechanical aptitude. Programmers and systems analysts must be able to think logically and enjoy solving problems.

This chapter describes three computer occupations: Computer Operating Personnel, Programmers, and Systems Analysts.

COMPUTER OPERATING PERSONNEL

(D.O.T. 213.138, .382, .582, .588, and .885, and 223.387)

Nature of the Work

All data systems require specialized workers to enter data and instructions, operate the computer, and retrieve the results. The data to be processed and the instructions for the computer are called "input"; the results are called "output."

In many systems, *keypunch operators* (D.O.T. 213.582) prepare input by punching patterns of holes in cards to represent different letters, numbers, and special characters, using a machine similar to a typewriter. In others, *data typists* (D.O.T. 213.588) use special machines that convert the information they type to holes in cards or magnetic impulses on tapes or disks. They also may type input material directly on-line into a computer.

Some computer systems only use input from magnetic tapes. *Card-to-tape converter operators* (D.O.T. 213.382) are needed to transfer data from punched cards or paper tapes to magnetic tapes. These workers wire plugboards to connect circuits according to prepared diagrams, load the machines with cards and tapes, and observe their operation for any malfunctions.

Once the input is coded, prepared in a form the computer can read, it is ready to be processed. *Console operators* (D.O.T. 213.382) examine the programmer's instructions for processing the input, make sure the computer has been loaded with the correct cards or magnetic tapes, and then start the computer. While it is running, they watch the machine, paying special attention to the error lights that could signal a malfunction. If the computer stops or one of the lights goes on, operators must locate the problem and remove the faulty input materials.

In some systems, machines directly connected to the computer translate output into the form desired by the programmer. In others, highspeed printers or converters run by auxiliary equipment operators—*high-speed printer operators* (D.O.T. 213.382) and *converter operators* (D.O.T. 213.382)—perform this function.

Frequently, the cards, magnetic tapes, and computer programs are kept for future use. *Tape librarians* (D.O.T. 223.387) classify and catalog this material and maintain files of program development records and computer operating instructions.

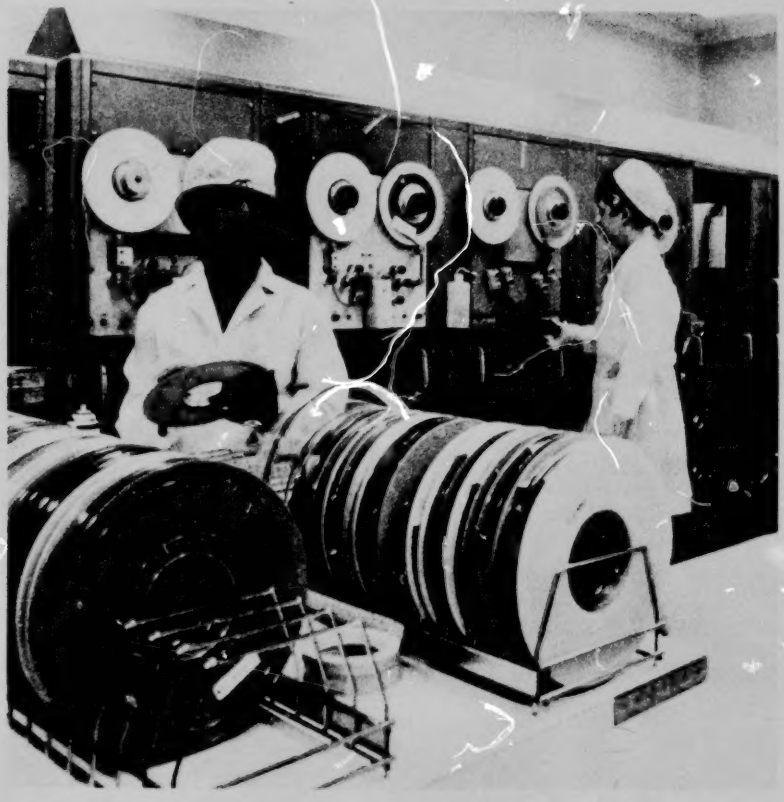
Places of Employment

About 500,000 persons worked as console, auxiliary equipment, and keypunch operators in 1974. Women held more than 90 percent of the keypunching jobs and nearly 45 percent of the console and auxiliary equipment jobs.

Although workers in these occupations are employed in almost every industry, most work in government agencies, manufacturing firms, banks, and insurance companies. Many computer and peripheral equipment operators, however, work for wholesale and retail trade establishments and data processing service organizations.

Training, Other Qualifications, and Advancement

In firms that have just installed a



Computer operators who work in scientific research installations may wear special clothing to prevent dust and fingerprints from marring sensitive magnetic tapes and equipment.

new computer system, tabulating and bookkeeping machine operators may be transferred to jobs as keypunch or auxiliary equipment operators, or console operators. Most often, however, employers recruit workers from the outside. Some organizations will train typists to operate keypunch machines, but most seek workers who already have this skill. Many high schools, public and private vocational schools, private computer schools, and business schools and colleges offer training in computer operating occupations.

Employers in private industry usually require applicants to have a high school education, and many prefer console operators to have some college training. The Federal Government requires a high school diploma, unless applicants have had specialized training or experience. Many employers test applicants to determine their aptitude for computer work, particularly their ability to reason logically. Keypunch operators and data typists are tested for their ability to work quickly and accurately.

Beginners usually are trained on the job. The length of training needed varies—auxiliary equipment operators can learn their jobs in a few weeks, but console operators require several months of training because they must become sufficiently familiar with the computer equipment to be able to trace the causes of failures.

Keypunch and auxiliary equipment operators should be able to work under close supervision as part of a team. They also must like working with machines and not become easily bored by repetitious tasks. Console operators must be capable of independent judgment, especially when working without supervision on second and third shifts.

Although advancement opportunities for keypunch and auxiliary equipment operators are limited, promotion to a supervisory position is possible after several years on the job. With additional training, often including college study, a few advance to jobs as console operators.

Console operators also may be promoted to supervisory positions, or to jobs that combine supervision and console operation. Through on-the-job-experience and additional training, some console operators advance to jobs as programmers.

Employment Outlook

Changes in data processing technology will have differing effects on computer operating occupations. Employment of keypunch operators is expected to decline through the mid-1980's because of advances in other data entry techniques and equipment. By contrast, expanding usage of computer hardware, especially terminals, will cause the demand for console and auxiliary equipment operators to rise very rapidly and employment is expected to grow faster than the average for all occupations.

Earnings and Working Conditions

Average weekly earnings of beginning keypunch operators in private industry ranged from $105 to $120 in 1974, according to surveys conducted in urban areas by the Bureau of Labor Statistics and firms engaged in research on data processing occupations. Lead

operators earned from $140 to $160 weekly.

Average weekly earnings of beginning console operators ranged from $140 to $160. Experienced workers earned from $180 to $205, and lead operators earned from $210 to $250 weekly.

Salaries of beginning operating personnel in the Federal Government are comparable to those in private industry. Console operators earned slightly more and keypunch operators slightly less than the average for all nonsupervisory workers in private industry, except farming.

Because electronic computers must be operated at carefully controlled temperatures, operators work in air-conditioned rooms. One disadvantage, however, is the high noise level generated by some auxiliary equipment. Some console and auxiliary equipment operators work evening or night shifts because many organizations use their computer 24 hours a day. Tape librarians usually work only day shifts.

Sources of Additional Information

Further information on data processing careers is available from:

American Federation of Information Processing Societies, 210 Summit Ave., Montvale, N.J. 07645.

PROGRAMMERS

(D.O.T. 020.188)

Nature of the Work

Computers can process masses of information rapidly and accurately, but only if they are given step-by-step instructions to follow. Because the machines cannot think for themselves, computer programmers must write detailed instructions called programs that list in a logical order the steps the machine must follow to solve a problem.

When a new problem is to be given to a computer, an experienced programmer first carefully examines the problem and determines the steps necessary to reach a solution. Programmers whose work includes a considerable amount of this preliminary analysis are sometimes called program analysts. Once this part of the job is finished, an applications programmer writes detailed instructions for processing the data, using one of the languages developed especially for computers.

Programs vary with the type of problem to be solved because the mathematical calculations involved in payroll accounting procedures, for example, are different from those required to determine the flight path of a space probe. A business applications programmer developing instructions for billing customers would first decide what company records the computer would need and then draw a flow chart or diagram showing the steps the computer must follow to obtain old balances, add new charges, calculate finance charges, and deduct payments before determining a customer's bill. Using the flow chart, the programmer writes the actual instructions the computer will follow.

The programmer then checks the operation of the program to be sure the instructions are correct and will produce the desired information. This check is called "debugging." The programmer tries a sample of the data with the program and reviews the results to see if any er-

Programmers sometimes use a terminal to enter data and instructions directly into the computer.

rors are made. If errors occur, the program must be changed and rechecked until it produces the correct results.

Finally, an instruction sheet is prepared for the computer operator who will run the program. (The work of computer operators is described in the statement on Computer Operating Personnel.)

Although simple programs can be written in a few days, programs which use complex mathematical formulas or many data files may require more than a year of work. In such cases, several programmers often work together under an experienced programmer's supervision.

Programmers usually specialize in either business or scientific operations because they require different types of educational backgrounds. Some programmers who have had training in systems analysis specialize in writing instructions for an entire operating system and are called systems programmers. These workers write programs that tell the computer how to schedule the jobs it has been given and when to switch from one to another. They also develop new computer languages.

Places of Employment

In 1974, about 200,000 persons—about three-fourths of them men—worked as computer programmers. Most were employed by manufacturing firms, banks and financial institutions, data processing service organizations, and government agencies.

Programmers usually work in large firms that need and can afford extensive computer systems. Small firms generally require computers only for payroll or billing purposes and frequently pay data processing service organizations to do this work. Systems programmers usually work in research organizations and computer manufacturing firms.

Training, Other Qualifications, and Advancement

There are no universal training requirements for progammers because employers' needs vary. Some programmers are college graduates; others have taken special courses in computer work to supplement their experience in fields such as accounting or inventory control.

Employers using computers for scientific or engineering applications prefer college graduates with degrees in the physical sciences, mathematics, engineering, or computer science. Graduate degrees are required for some jobs. Very few scientific organizations are interested in applicants with no college training.

Although many employers who use computers for business applications do not require college degrees, they prefer applicants who have had college courses in data processing, accounting, and business administration. Occasionally, workers who are experienced in machine tabulation or payroll accounting but have no college training are promoted to programming jobs; however, they need additional data processing courses to become fully qualified programmers.

Computer programming is taught at a growing number of technical schools, colleges and universities. Instruction ranges from introductory home study courses to advanced courses at the graduate level. High schools in many parts of the country also offer courses in computer programming.

In hiring programmers, employers look for people who can think logically and are capable of exacting analytical work. The job also calls for patience, persistence, and the ability to work with extreme accuracy even under pressure. Ingenuity and imagination are particularly important when programmers must find new ways to solve a problem.

Beginning programmers usually spend their first weeks on the job attending training classes. After this initial instruction, they work on simple assignments while completing further specialized training programs. Programmers generally must spend at least a year working under close supervision before they can handle all aspects of their job. Once skills have been acquired, however, the prospects for further advancement are good. In large organizations, they may be promoted to lead programmers or systems analysts and have supervisory responsibilities.

Employment Outlook

Employment of programmers is expected to grow faster than the average for all occupations through the mid-1980's as computer usage expands, particularly in medical, educational, and data processing services. In addition to job openings resulting from growth of the occupation, several thousand openings will arise each year from the need to replace workers who leave the occupation. Because many programmers are relatively young, few openings will result from deaths or retirements.

The demand for applications programmers will increase as many processes once done by hand are automated, but employment will not grow as rapidly as in the past for several reasons. Improved programming languages that can be used by other than data processing personnel will simplify or eliminate some programming tasks. Also, many programs for business operations have been standardized and are sold to computer users by computer manufacturers and "software" companies that specialize in writing programs. Job opportunities will be best for systems programmers and applications programmers who have had some training in systems analysis.

Earnings and Working Conditions

Average weekly earnings of beginning programmers in private industry ranged from $170 to $240 in 1974, according to surveys conducted in urban areas by the Bureau of Labor Statistics and firms engaged in research on data processing occupations. Experienced workers earned from $260 to $335 weekly, and lead programmers earned from $295 to $360. Earnings of applications programmers are generally at the lower end of the scale, systems programmers at the higher end.

Salaries in the Federal Government are comparable to those in private industry. Programmers working in the North and West earned somewhat more than those working in the South. Those working for data processing services and manufacturing firms had higher earnings than programmers employed in banks, advertising, or educational institutions. Overall, programmers earned about twice as much as the average for all nonsupervisory workers in private industry, except farming.

Programmers work about 40 hours a week, but their hours are not always from 9 to 5. Once or twice a week a programmer may report early or work late to use the computer when it is available. Occasionally, they work on weekends or are telephoned to advise computer operators working a second or third shift.

Sources of Additional Information

Additional information about the occupation of programmer is available from:

American Federation of Information Processing Societies, 210 Summit Ave., Montvale, N.J. 07645.

SYSTEMS ANALYSTS

(D.O.T. 003.187, 012.168, 020.031 and 020.088)

Nature of the Work

Many essential business functions and scientific research projects depend on systems analysts to plan efficient methods of processing data and handling the results. Analysts begin an assignment by discussing the data processing problem with managers or specialists in the area concerned. If a new inventory system is desired, for example, analysts must determine what new data need to be collected, the equipment needed for processing, and the procedure to be followed in using the information.

Analysts use various techniques, such as cost accounting, sampling, and mathematical model building to analyze the problem and devise a new system. Once a system has been developed, they prepare charts and diagrams that describe its operation in terms that managers or customers can understand.

If the system is accepted, analysts prepare instructions for programmers and test the operation of the system.

The problems systems analysts must solve range from monitoring nuclear fission in a powerplant to forecasting sales for an appliance manufacturing firm. Because the work is so varied and complex, most analysts specialize in either business or scientific and engineering applications.

Some analysts improve systems already in use by developing better procedures or adapting the system to handle additional types of data. Others do research, called advanced systems design, to devise new methods of systems analysis.

Systems analyst checks results of a sales forecasting program with data processing manager.

Places of Employment

About 115,000 persons—10 percent of them women—worked as systems analysts in 1974. Most worked in urban areas for manufacturing firms, wholesale and retail businesses, and data processing service organizations. In addition, large numbers worked for banks, insurance companies, and educational institutions.

Training, Other Qualifications, and Advancement

There is no universally acceptable way of preparing for a job as a systems analyst because employers' preferences depend on the work being done. Employers usually want analysts with backgrounds in accounting, business, or economics for work in finance, while persons with backgrounds in the physical sciences, mathematics, computer science, or engineering are preferred for work in scientifically oriented organizations. Some employers prefer applicants who have a bachelor's degree and work experience in one of these fields. Others stress a graduate degree. Applicants also may qualify on the basis of professional experience as a programmer or computer operator.

Most employers prefer people who have had some experience in computer programming. Beginning analysts without this experience can learn to use electronic data processing equipment on the job, or can take special courses offered by their employers, computer manufacturers, or colleges. In the Federal Government and many industries, systems analysts begin their careers as programmers and are promoted to analyst trainees after gaining some experience and acquiring additional training. Later they are promoted to systems analysts.

Systems analysts must be able to think logically and should like working with ideas. Although most systems analysts work independently, they sometimes work in teams on large projects. The ability to concentrate and pay close attention to details also is important.

In large data processing departments, persons who begin as junior systems analysts may be promoted to senior or lead systems analysts after several years of experience. Systems analysts who show leadership ability also can advance to jobs as managers of systems analysis or data processing departments.

Employment Outlook

Employment of systems analysts is expected to grow faster than the average for all occupations through the mid-1980's as computer usage expands, particularly in medical, educational, and data processing services. In addition to opportunities that will result from growth, some openings will occur as systems analysts advance to managerial positions or enter other occupations. Because many of these workers are relatively young, few positions will result from retirement or death.

The demand for systems analysts is expected to increase as users become more familiar with computer capabilities and expect greater efficiency and performance from their data processing systems. Advances in hardware and computer programs will result in expanded computer applications in manufacturing and small businesses, and this, too, will contribute to employment growth.

Earnings and Working Conditions

Average weekly earnings for beginning systems analysts in private industry ranged from $230 to $250 in 1974, according to surveys conducted in urban areas by the Bureau of Labor Statistics and private firms engaged in research on computer occupations. Experienced workers earned from $300 to $335, and lead systems analysts earned from $335 to $360 weekly. Earnings in the Federal Government were comparable to those in private industry.

Systems analysts working in the North and West earned somewhat more than those in the South and generally their earnings were greater in data processing or manufacturing firms than in banks or educational institutions. Overall, systems analysts earn more than twice as much as the average for all nonsupervisory workers in private industry, except farming.

Systems analysts usually work about 40 hours a week—the same as other professional and office workers. Unlike many computer operators, systems analysts are not assigned to evening or night shifts. Occasionally, however, evening or weekend work may be necessary to complete emergency projects.

Sources of Additional Information

Further information about the occupation of systems analyst is available from:

American Federation of Information Processing Societies, 210 Summit Ave., Montvale, N.J. 07645.

BANKING OCCUPATIONS

Modern banks offer a variety of services to meet the needs of their customers. They provide checking and savings accounts, loans, trust fund management, and financial counseling.

Bank work is highly specialized, and most employees gain experience and skill through on-the-job training. Although banks usually seek college graduates for officer trainee jobs, opportunities for high school graduates are plentiful in other bank jobs. Opportunities for advancement are good. Bank employees can qualify for better positions by enrolling in programs offered by the American Institute of Banking, or by taking college courses in finance and business.

Bank employees should enjoy working with numbers and be able to perform detailed work. Personal qualifications such as honesty and the ability to meet and communicate with customers are important.

This section discusses three office occupations unique to banking: Clerks, Tellers, and Officers.

BANK CLERKS

(D.O.T. 209.388, 210.388, 215.388 217.388, 219.388 and .488)

Nature of the Work

All complex organizations need clerks to handle their paperwork. Because of the specialized nature of banking, some of the duties of bank clerks differ from those of clerks in other businesses. (Secretaries, office machine operators, receptionists, and other clerical workers whose jobs are much the same in banks as in other businesses are discussed elsewhere in the *Handbook*.)

In a small bank, one clerk may do several jobs, such as sorting checks, totaling debit and credit slips, and preparing monthly statements for depositors. In a large bank, however, each clerk usually specializes and frequently has a special job title, as well.

Bank clerks known as *sorters* (D.O.T. 219.388) separate documents—checks, deposit slips, and other items—into different groups and tabulate each "batch" so they may be charged to the proper accounts. Often the clerks use canceling and adding machines in their work. Many banks also employ *proof machine operators* (D.O.T. 217.388), who use equipment that sorts items and then both adds and records the amounts of money involved.

Bookkeeping workers are the largest single group of bank clerks. *Bookkeeping machine operators* (D.O.T. 215.388) may use conventional bookkeeping machines or electronic posting machines to record financial transactions. In banks, these workers are sometimes known as account clerks, posting machine operators, or recording clerks. *Bookkeepers'* (D.O.T. 210.388) job titles sometimes relate to the kinds of records they keep—for example, Christmas club bookkeeper, discount bookkeeper, interest-accrual bookkeeper, trust bookkeeper, and commodity loan clerk. Thousands of *bookkeeping and accounting clerks* (D.O.T. 219.488) also do routine typing, calculating, and posting. Included in this group are reconcilement clerks, who process statements from other banks to aid the auditing of accounts, and trust investment clerks, who post the daily investment transactions of bank customers.

Other clerical employees whose duties and job titles are unique to banking include *country collection clerks* (D.O.T. 219.388), who sort thousands of pieces of mail daily and determine which items must be held at the main office and which should be routed to branch banks for collection. Also employed are *transit clerks* (D.O.T. 217.388), who sort checks and drafts on other banks, list and total the amounts involved, and prepare documents to be mailed for collection; *exchange clerks* (D.O.T. 219.388), who service foreign deposit accounts and determine charges for cashing or handling checks drawn against such accounts; *interest clerks* (D.O.T. 219.388), who keep records on interest-bearing items that are due to or from the bank; and *mortgage clerks* (D.O.T. 209.388), who type legal papers dealing with real estate upon which money has been loaned, and maintain records relating to taxes and insurance on these properties.

Electronic data-processing has created several new clerical occu-

pations unique to banking. These include the electronic reader-sorter operator who runs electronic check sorting equipment; the check inscriber or encoder who operates machines that print information on checks and other documents in magnetic ink to prepare them for machine reading; and the control clerk who keeps track of the large volume of documents flowing in and out of the computer division. Other occupations include card-tape converter operator, coding clerk, console operator, data typist, data converting machine operator, data examination clerk, high speed printer operator, tape librarian, teletype operator, and verifier operator.

Most of the 517,000 clerical employees working in banks in 1974 were women.

Training, Other Qualifications, and Advancement

High school graduation is considered adequate preparation for most beginning clerical jobs in banks. Courses in bookkeeping, typing, business arithmetic, and office machine operation also are desirable. Applicants may be given brief tests to determine their ability to work rapidly and accurately, and to communicate effectively with others. They should be able to work as part of a team and under close supervision.

Beginners may be hired as file clerks, keypunch operators, transit clerks, clerk-typists, or for related work. Some are trained by the bank to operate various office machines. A few start as messengers.

A clerk in a routine job may be promoted to a clerical supervisory position, to teller or credit analyst, and eventually to senior supervisor. Advancement to a bank officer position is a possibility for outstanding clerks who have had college training or have taken specialized courses in banking.

Additional education—particularly the courses offered by the American Institute of Banking—may help workers advance. (See statement on the Banking Industry for information on the Institute's educational program.)

Employment Outlook

Employment of bank clerks is expected to grow faster than the average for other occupations through the mid-1980's. In addition to opportunities stemming from employment growth, many jobs will open up from the need to replace the large number of clerks who leave their jobs each year. As a result, banking should continue to be a good source of employment opportunities for clerical workers.

Jobs for clerks will arise as established banks expand their services and new banks and branches open. Nearly all banks use electronic equipment that lessens demand for some workers, such as check sorters and bookkeeping machine operators. Moreover, the jobs of keypunch operators and others who prepare data for computer input are being affected by developments in computer technology and increased use of remote terminals.

Most workers affected by a shift in computer technology will be retrained and reassigned, either to new jobs created by the change in equipment and methods, or to duties related to new banking services. Overall, the volume of work is expected to be so great that the number of clerks will continue to grow.

Earnings

Clerical workers in financial institutions, including banks, usually earned between $90 and $170 a week in 1974, according to a Bureau of Labor Statistics survey.

Experienced secretaries and tabulating machine operators received the highest weekly salaries: $150 and $170. The earnings of beginning file clerks and messengers were generally the lowest: $90 and $100 a week.

See the statement on the Banking Industry for additional information.

BANK OFFICERS

(D.O.T. 186.118, .138, .168, and .288; 161.118, 189.118 and .168)

Nature of the Work

Practically every bank has a president who directs operations; one or more vice presidents who act as general managers or who are in charge of bank departments such as trust or credit; and a comptroller or cashier who, unlike cashiers in stores and other businesses, is an executive officer generally responsible for all bank property. Large banks also may have treasurers and other senior officers, as well as junior officers, to supervise the various sections within different departments. Banks employed almost 240,000 officers in 1974; women were about one-fifth of the total.

Bank officers make decisions within a framework of policy set by the board of directors and existing laws and regulations. They must have a broad knowledge of business activities to relate to the operations of their department. For example, loan officers evaluate the credit and collateral of individuals and businesses applying for a loan. Similarly, trust officers must understand each account before they invest funds to support families, send young people to college, or pay retirement pensions. Besides supervising financial services, officers advise individuals and businesses and participate in community projects.

Because banks offer many services, a wide choice of careers is available to workers who specialize.

Loan officers may handle installment, commercial, real estate, or agricultural loans. To evaluate loan

applications properly, officers need to be familiar with economics, production, distribution, merchandising, and commercial law. Also, they need to know business operations and should be able to analyze financial statements.

Bank officers in the field of trust management require knowledge of financial planning and investment for purposes of investment research and for estate and trust administration.

Operations officers plan, coordinate, and control the work flow, update systems, and strive for administrative efficiency. Careers in bank operations include electronic data processing manager and other positions involving internal and customer services.

A correspondent bank officer is responsible for relations with other banks; a branch manager, for all functions of a branch office; and an international officer, for advising customers with financial dealings abroad. A working knowledge of a foreign country's financial system, trade relations, and economic conditions is beneficial to those interested in international banking.

Other career fields for bank officers are auditing, economics, personnel administration, public relations, and operations research.

Training, Other Qualifications, and Advancement

Bank officer positions are filled by management trainees or by promoting outstanding bank clerks or tellers. College graduation usually is required for management trainees. A business administration major in finance or a liberal arts curriculum including accounting, economics, commercial law, political science, and statistics serves as excellent preparation for officer trainee positions. Valuable experience may be gained through summer employment programs.

Many banks have well-organized officer-training programs usually ranging from 6 months to 1 year. Trainees may start as credit or investment analysts or may rotate among bank departments to get the "feel" of banking; bank officials then can determine the position for which each employee is best suited.

Persons planning to become bank officers should like to work independently and analyze detailed information. They also need tact and good judgment in order to counsel customers.

Advancement to officer may come slowly in small banks where the number of positions is limited. In large banks that have special training programs, promotions may come more quickly. For a senior officer position, however, an employee usually needs many years of experience.

Although experience, ability, and leadership are emphasized for promotion, advancement also may be accelerated by special study. Courses in every phase of banking are offered by the American Institute of Banking, a long-established, industry-sponsored school. (See the statement on the Banking Industry elsewhere in the *Handbook* for more information on the Institute's program and other training programs sponsored by universities and local bankers' associations.)

Employment Outlook

Through the mid-1980's, employment of bank officers is expected to increase faster than the average for all occupations. The increasing dependence on computers and an expansion in the services offered by banks will require growing numbers of officers to provide sound management and effective quality control. Opportunities also will

arise as experienced officers leave their jobs. College graduates who meet the standards for management trainees should find good opportunities for entry positions. However, many senior officer positions will be filled by promoting people already experienced in banking. Competition for these promotions, particularly in large banks, is likely to be keen.

Earnings

Large banks, insurance companies, and other financial institutions paid executive trainees who were college graduates starting salaries ranging from about $730 to $930 a month in 1974, according to the limited information available.

Salaries of senior bank officers may be several times as great as these starting salaries. For officers, as well as for other bank employees, earnings are likely to be lower in small towns than in big cities.

See the statement on the Banking Industry elsewhere in the *Handbook* for additional information on banking occupations.

BANK TELLERS

(D.O.T. 212.368)

Nature of the Work

Every bank, no matter how small, has at least one teller who receives and pays out money and records these transactions. In a very small bank, one *all-round teller* may handle all transactions; in larger banks different kinds of transactions usually are assigned to different tellers. For example, a *Christmas Club teller* accepts and records deposits made to Christmas Club savings accounts and a *note teller* handles certain transactions for clients who have made loans. Other tellers who have special job titles include *commercial* (or *paying and receiving*) *savings*, *foreign exchange*, *payroll*, *discount*, and *securities tellers*.

Commercial tellers, the most common, cash customers' checks and handle deposits and withdrawals from checking and savings accounts. Before cashing a check, the teller must verify the identity of the person to whom payment is made, and must be certain that the payee's account has sufficient funds to cover the payment. When accepting a deposit, the teller checks the accuracy of the deposit slip and enters the total in a passbook or on a deposit receipt. Tellers may use machines for making change and for totaling deposits. Those who handle savings accounts may use a "window" posting machine to print a receipt, record the transaction in the customer's passbook, and simultaneously post the transaction to the bank's ledger.

After banking hours, tellers count cash on hand, list the currency-received tickets on a settlement sheet, and balance the day's accounts. They also sort checks and deposit slips. Paying and receiving tellers may supervise one or more clerks.

About 270,000 tellers were employed in 1974. A large number worked part time; about 9 out of 10 were women.

Training, Other Qualifications, and Advancement

In hiring tellers, banks prefer high school graduates experienced in clerical work. Maturity, neatness, tact, and courtesy are important because customers deal with tellers far more frequently than with other bank employees. Since tellers handle large sums of money and are bonded, they must meet the standards established by bonding companies. Although tellers work independently, their recordkeeping is

closely supervised. They work with detail and are confined to a small work area.

New tellers usually observe experienced workers for a few days before doing the work themselves. Training may last from a few days to 3 weeks or longer. Beginners usually start as commercial tellers; in large banks which have a separate savings teller's "cage," they may start as savings tellers.

After gaining experience, a teller in a large bank may advance to head teller; those who have had some college or specialized training offered by the banking industry may be promoted to officer. (See the statement on the Banking Industry for information about the educational programs of the American Institute of Banking.)

Employment Outlook

The number of bank tellers is expected to increase faster than the average for all occupations through the mid-1980's as banks expand their services. An increasing proportion of tellers, however, will work part-time during the noon hour and evenings to accommodate customers who transact business during these peak periods. Thousands of openings will occur each year as a result of employment growth and the need to replace tellers who retire, die, or stop working for other reasons. The relatively high replacement needs in this occupation are expected to be an important source of job opportunities. Qualified applicants should find good employment prospects.

Although increased use of mechanical and electronic equipment may eliminate some routine duties and speed other work, total employment is not likely to be adversely affected.

Earnings

All nonsupervisory workers in banking, including tellers, averaged $121 a week in 1974, according to a Bureau of Labor Statistics survey. The range between the lowest and highest salaries depends on experience, the worker's specific duties, and location and size of the bank.

See the statement on the Banking Industry elsewhere in the *Handbook* for additional information on this and other banking occupations.

INSURANCE OCCUPATIONS

Insurance protection is an integral part of the American way of life. It frees policyholders and their beneficiaries from worry and financial burdens that may result from death, illness, or other losses beyond their control. Businesses could not operate, nor could most people buy homes or other major items, without the assurance of protection from sudden disaster. Insurance workers adapt policies to meet changing needs, decide which applications can be accepted and establish premium rates on the policies, and investigate and settle claims.

A college degree is increasingly important for professional, technical, and managerial jobs in insurance, although some positions are open to high school graduates who have appropriate experience. Insurance workers in clerical positions need a high school diploma. Regardless of their previous training, insurance workers must continually learn while on the job. Many professional associations sponsor courses in all phases of insurance work; employees are encouraged to participate to prepare themselves for more responsible jobs.

This section describes three insurance occupations: Actuaries, Claim Representatives, and Underwriters. (Statements on the Insurance Industry and Insurance Agents and Brokers are included elsewhere in the *Handbook*.)

ACTUARIES

(D.O.T. 020.188)

Nature of the Work

Why do young persons pay more for automobile insurance than older persons? How much should an insurance policy cost? Answers to these and similar questions are provided by actuaries who design insurance and pension plans that can be maintained on a sound financial basis. They assemble and analyze statistics to calculate probabilities of death, sickness, injury, disability, unemployment, retirement, and property loss from accident, theft, fire, and other potential hazards. Actuaries use this information to determine the expected insured loss. For example, they may calculate how many persons who are 21 years old today can be expected to live to age 65—the probability that an insured person might die during this period is a risk to the company. They then calculate a price for assuming this risk that will be profitable to the company yet be competitive with other insurance companies. Finally, they must make sure that the price charged for the insurance will enable the company to pay all claims and expenses as they occur. In the same manner, the actuary calculates premium rates and policy contract provisions for each type of insurance offered. Most actuaries specialize in either life and health insurance or in property and liability (casualty) insurance.

To perform their duties effectively, actuaries must keep informed about general economic and social trends, and legislative, health, and other developments that may affect insurance practices. Because of their broad knowledge of insurance, actuaries may work on problems arising in the company's investment, group underwriting, or pension planning departments. Actuaries in executive positions help determine general company policy. In that role, they may be called upon to explain complex technical matters to company executives, government officials, and the public. They may testify before public agencies on proposed legislation affecting the insurance business, for example, or explain intended changes in premium rates or contract provisions.

Actuaries who work for the Federal Government usually deal with a particular insurance or pension program, such as social security or life insurance for veterans and members of the Armed Forces. Actuaries in State government positions regulate insurance companies, supervise the operations of State retirement or pension systems, and work on problems connected with unemployment insurance or workers' compensation. Consulting actuaries set up pension and welfare plans and make periodic evaluations of these plans for private companies, unions, and government agencies.

Places of Employment

Approximately 10,700 persons worked as actuaries in 1974. Four of every 10 actuaries worked in five major cities—New York, Hartford, Chicago, Philadelphia, and Boston.

About two-thirds of all actuaries worked for private insurance companies. Almost 90 percent of them worked for life insurance companies; the rest worked for property and liability (casualty) companies. The number of actuaries employed by an insurance company depends on the volume of its business and the number and types of insurance policies it offers. Large companies may employ over 100 actuaries on

their staffs or rely instead on rating bureaus or consulting firms.

Consulting firms and rating bureaus (associations that supply actuarial data to member companies) employed about one-fifth of all actuaries. Other actuaries work for private organizations administering independent pension and welfare plans or for Federal and State government agencies. A few teach in colleges and universities.

Training, Other Qualifications, and Advancement

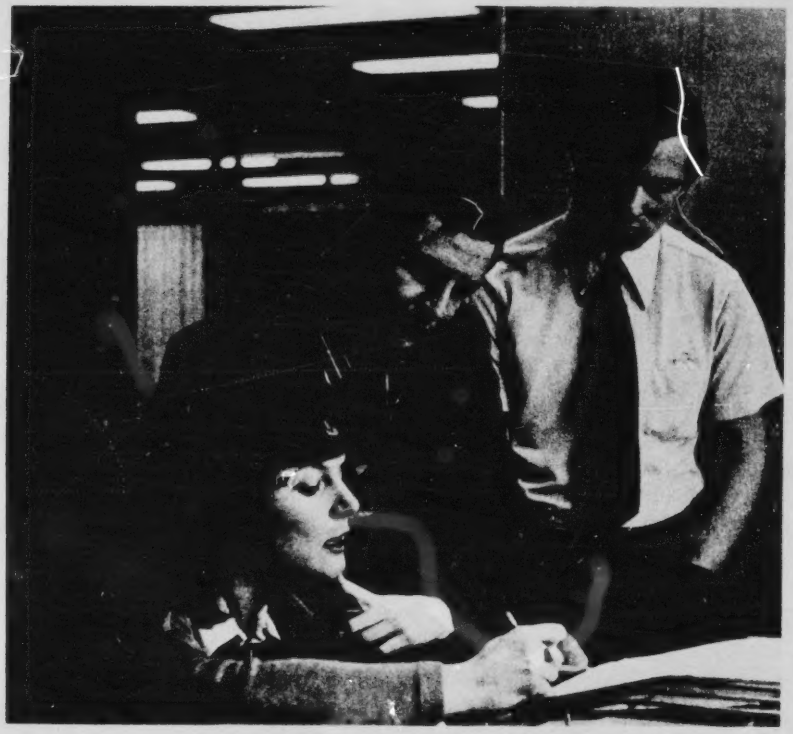
The minimum requirement for beginning jobs in large life or casualty companies is a bachelor's degree with a major in mathematics or statistics. Some companies will hire applicants with a major in economics or business administration who demonstrate a thorough foundation in calculus, probability, and statistics (20-25 hours). Other desirable courses are insurance law, economics, and accounting. Although only 17 colleges and universities offer training specifically designed for actuarial careers, several hundred schools offer some of the necessary courses.

It usually takes from 5 to 10 years after beginning an actuarial career to complete the entire series of examinations required for full professional status. These examinations cover general mathematics, specialized actuarial mathematics, and all phases of the insurance business. Those considering an actuarial career should take at least the beginning examination covering general mathematics while still in college. Success in passing the first two examinations helps beginners to evaluate their potential as actuaries. Those who pass these examinations usually have better opportunities for employment and receive a higher starting salary. Advanced examinations, usually taken by those in junior actuarial positions, require extensive home study and experience in insurance work.

The Society of Actuaries gives 10 actuarial examinations for the life insurance and pension field; the Casualty Actuarial Society also gives 10 for the property and liability field. Since the first parts of the examination series of either society are the same, students may defer the selection of their insurance specialty until they become more familiar with the field. Persons who complete five examinations in the life insurance series or six in the casualty series are awarded "associate" membership in their respective society. Those who have passed an entire series receive full membership and the title "fellow."

Beginning actuaries often rotate among different jobs to learn various actuarial operations and to become familiar with different phases of insurance work. At first, their work may be rather routine, such as preparing calculations or tabulations for actuarial tables or reports. As they gain experience, they may supervise actuarial clerks, prepare correspondence and reports, and do research.

Advancement to more responsible work as assistant, associate, and chief actuary depends largely on job performance and the number of actuarial examinations passed. Many actuaries, because of their broad knowledge of insurance and related fields, are selected for administrative positions in other company activities, particularly in underwriting, accounting, or data processing departments. Many actuaries advance to top executive positions.



Actuaries discussing a problem.

Employment Outlook

Employment of actuaries is expected to rise faster than the average for all occupations through the mid-1980's. In addition to job

openings resulting from this growth, several hundred actuaries will be needed each year to replace those who retire, die, or transfer to other occupations. Job opportunities will be best for new college graduates who have passed at least one actuarial examination while still in school and have a strong mathematical and statistical background. However, because of the large number of persons expected to receive degrees in mathematics, and the large number of students taking actuarial examinations, competition for beginning jobs should remain keen.

Employment in this occupation is influenced by the volume of insurance sales, which will continue to grow over the next decade. Shifts in the age distribution of the population over the next decade will result in many more people with established careers and family responsibilities. This is the group traditionally responsible for the bulk of private insurance sales.

Increased sales, however, are only one determinant of demand. Changes in existing insurance practices are creating a need for more actuarial services. For example, passage of a "no-fault" automobile insurance plan would require companies writing automobile insurance to reevaluate their pricing structures in light of no-fault requirements. It is uncertain at this time whether Federal no-fault legislation will be enacted; however, the growing number of States enacting their own plans indicates continued strong demand for actuaries to make these analyses. The Pension Reform Act of 1974 is likely to stimulate employment of actuaries, particularly in consulting firms. As more States pass competitive rating laws, companies which previously relied on rating bureaus for actuarial data will expand existing actuarial departments or create new ones.

Changes in the way medical malpractice insurance is handled also may generate additional demand for actuaries.

Earnings and Working Conditions

In 1974, actuaries had average salaries over twice as high as the average for all nonsupervisory workers in private industry, except farming. New college graduates entering the life insurance field without having passed any actuarial exams averaged $9,800 in 1974, according to a survey of U.S. companies by the Life Office Management Association (LOMA). Applicants who had successfully completed the first exam received $10,400 and those who had passed two exams averaged $11,100. Salaries for actuaries in casualty companies generally are comparable to those offered by life companies.

In the Federal Government, new graduates with the bachelor's degree could start at $8,500 a year in late 1974. Applicants with either 1 year of graduate study or relevant work experience were hired at $10,500, and those with the master's degree started at $12,800 a year. Actuaries in the Federal Government averaged $22,800 a year in late 1974.

Beginning actuaries can look forward to a marked increase in earnings as they gain professional experience and successfully advance in either society's examination program. Insurance companies usually give merit increases averaging from $400 to $800 to their actuaries as they pass each successive examination leading to membership in either society. Associates averaged $16,400 a year in 1974; salaries for actuaries who were awarded full fellowship during that year averaged $22,700. Fellows with additional years of experience earned substantially more, and many top actuarial executives were paid over $35,000.

Sources of Additional Information

For facts about actuarial opportunities and qualifications, contact:

Casualty Actuarial Society, 200 East 42nd St., New York, N.Y. 10017.

Society of Actuaries, 208 South LaSalle St., Chicago, Ill. 60604.

CLAIM REPRESENTATIVES

(D.O.T. 168.288, 191.268, 241.168, and 249.268)

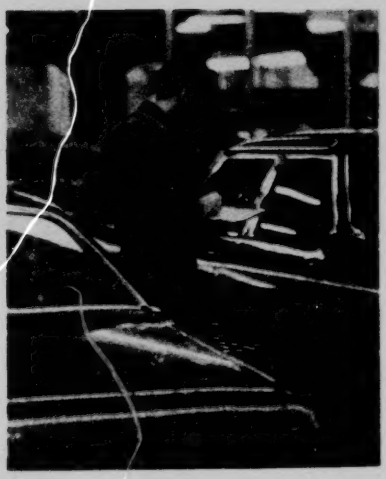
Nature of the Work

Fast and fair settlement of all claims is essential to any insurance company if it is to meet its commitments to policyholders and also protect its own financial well-being. The people who investigate claims, negotiate settlement with policyholders, and authorize payment are known as claim representatives—a group which includes claim adjusters and claim examiners.

When a property-liability (casualty) insurance company receives a claim, the *claim adjuster* determines the amount of the loss and whether the policy covers it. Adjusters use reports, physical evidence, and testimony of witnesses in investigating a claim. When their company is liable, they negotiate with the claimant and settle the case.

Adjusters must make sure that settlements are in line with the real extent of the loss. They must protect their company from false or inflated claims but, at the same time, settle valid claims fairly and promptly. Some adjusters are allowed to issue checks on company funds; most, however, submit their findings to claim examiners who review them to insure that proper procedures have been followed and then authorize payment.

Some adjusters work with all lines of insurance. Others specialize



Adjuster determines extent of auto body damage.

in claims from property damage by fire, marine loss, automobile damage, workers' compensation loss, or bodily injury. Several States have "no-fault" automobile insurance plans that relieve the adjuster from determining responsibility for a loss. Adjusters in these States still must decide the amount of loss, however. A growing number of casualty companies employ special claims people to settle small claims, usually minor automobile or homeowner damage claims. These claim workers, generally called "inside adjusters" or "telephone adjusters," contact claimants by telephone or mail and have the policyholder send repair costs, medical bills, and other statements to the company. Many companies centralize this operation in a drive-in claims center where the cost of repair is determined and a check is issued on the spot.

Adjusters work away from the office most of the time. They may be called to the site of an accident or to the location of a fire or burglary. Adjusters make their own schedules of the activities needed to dispose of a claim properly. They also keep written or taped records of information obtained from witnesses and other sources and prepare reports of their findings.

In life insurance companies, the counterpart of the claim adjuster is the *claim examiner*, who investigates the details surrounding questionable claims or those exceeding a specified amount. They may check claim applications for completeness and accuracy, interview medical specialists, consult policy files to verify information on a claim, or calculate benefit payments. Generally, examiners are authorized to investigate and approve payment on all claims up to a certain limit; larger claims are referred to a senior examiner.

Examiners checking incorrect or questionable claims may correspond with investigating companies, field managers, agents, or the family of the insured. Claim examiners occasionally travel to obtain information by personal interview, or contact State insurance departments and other insurance companies. In addition to verifying claims and approving payment, examiners also maintain records of settled claims and prepare reports to be submitted to their company's data processing department. Some experienced examiners serve on committees, conduct surveys of claim practices within their company, and help devise more efficient ways to process claims. They sometimes testify in court on contested claims.

Places of Employment

About 125,000 persons worked as claim representatives in 1974.

The majority of claim adjusters worked for insurance companies that sell property and liability

Claim examiner calculates benefit payment.

coverage. Some were employed by independent adjusting firms that contract their services for a fee. These independents range from national companies employing hundreds of adjusting specialists to small 3- or 4-person operations. A relatively small number of adjusters represent the insured rather than the insurance company. These 'public adjusters' usually are retained by banks, financial organizations, and other business firms to handle fire and other losses to property. They negotiate claims against insurance companies and deal with adjusters for such companies.

Most claim examiners worked for life insurance companies in large cities such as New York, Hartford, Chicago, San Francisco, and Dallas, where most home offices are located.

Adjusters may travel to almost any area of the United States, since claims must be settled locally. Occasionally, the adjuster may travel to the scene of a disaster, such as a hurricane or a riot, to work with local personnel. Some cases result in travel outside the United States.

Training, Other Qualifications, and Advancement

Although a growing number of insurance companies prefer claim representatives to have a college degree, many hire those without college training, particularly if they have specialized experience. For example, persons experienced in automobile repair work may qualify as auto adjusters, and those with clerical work experience might be hired as inside adjusters.

No specific field of college study is recommended. Although courses in insurance, economics, or other business subjects are helpful, a major in almost any college field is adequate preparation. An adjuster who has a business or accounting background might specialize in loss from business interruption or damage to merchandise. Those with college training in engineering will find their education helpful in adjusting industrial claims.

Most large insurance companies provide beginning claim adjusters and examiners on-the-job training and home study courses. Claim representatives are encouraged to take courses designed to enhance their professional skills. For example, the Insurance Institute of America offers a 6-semester study program leading to a diploma in insurance loss and claim adjusting upon successful completion of six examinations. Adjusters can prepare for these examinations by independent home study or through company or public classes. A professional Certificate in Insurance Adjusting also is available from the College of Insurance in New York City.

The Life Office Management Association (LOMA) in cooperation with the International Claim Association offers a claims education program for life and health examiners. The program is part of the LOMA Institute Insurance Education Program leading to the professional designation, FLMI (Fellow, Life Management Institute) upon successful completion of eight written examinations.

About three-fourths of the States require adjusters to be licensed. Despite wide variation in State licensing requirements, applicants usually must comply with one or more of the following: Pass a written examination covering the fundamentals of adjusting; furnish character references; be 20 or 21 years of age and a resident of the State; offer proof that they have completed an approved course in insurance or loss adjusting; and file a surety bond.

Because they often work closely with claimants, witnesses, and other insurance professionals, representatives must be able to adapt to many different persons and situations. They should be able to communicate effectively and gain the respect and cooperation of people from different backgrounds. For example, when adjusters' evaluations of claims differ from those of the persons who have suffered the loss, they should be able to explain their conclusions tactfully. Examiners need to be familiar with medical and legal terms and practices and Federal and State insurance laws and regulations. Because they may have to check premium payments, policy values, and other numerical items in processing a claim, examiners should be adept at making mathematical calculations. Both adjusters and examiners should have a good memory and enjoy working with details.

Beginning adjusters and examiners work on small claims under the supervision of an experienced worker. As they learn more about claim investigation and settlement, they are assigned claims that are higher in loss value and more difficult. Trainees are promoted as they demonstrate competence in handling assignments and progress in the courses they take. Because of the complexity of insurance regulations and claims procedures, workers who lack formal academic training may advance more slowly than those with 2 years or more of college. Employees who show unusual competence in claims work or outstanding administrative skills may be promoted to department supervisor in a field office or to a managerial position in the home office. Qualified adjusters and examiners can transfer to other departments, such as underwriting or data processing.

Employment Outlook

Employment of claim representatives is expected to grow about as fast as the average for all occupations through the mid-1980's as the number of insurance claims continues to increase. In addition to jobs created by growth of the occu-

pation, many others will result from the need to replace workers who die, retire, or transfer to other jobs.

Several factors point to a growing volume of insurance and a resulting need for claim adjusters. Shifts in population patterns over the next decade will insure a steadily rising number of workers entering their most productive years. These workers and their families are likely to seek insurance protection as they purchase homes, automobiles, and other consumer durables. Expanding business will need protection for new plants and equipment and for insurance covering workers' compensation and product liability. As more people live and work in densely populated areas, the increased risk of automobile accident, fire, or theft should result in a greater number of claims.

Growth of this occupation may be slower than in recent years as no-fault automobile insurance plans enable adjusters to handle more cases. The growing emphasis on drive-in claim centers and claim handling by telephone also should reduce the demand for automobile adjusters while it stimulates demand for inside adjusters. Independent adjusters who specialize in automobile damage claims should continue to suffer some loss of business. Prospects are expected to be quite good for adjusters who specialize in other types of claims or those who can move into other lines of adjusting.

Prospects are much less favorable for claim examiners. Employment of examiners in casualty companies should rise about as fast as for adjusters; however, much slower growth is expected for life insurance examiners as increased use of computers enables them to process more claims, especially routine ones and those that arise under group policies.

Earnings and Working Conditions

According to an American Insurance Association-American Mutual Insurance Alliance-National Association of Independent Insurers survey of property and liability companies, claim adjusters averaged about $11,900 a year in 1974; inside adjusters earned average salaries of about $8,300. Most public adjusters are paid a percentage of the amount of the settlement—generally 10 percent. Adjusters are furnished a company car or are reimbursed for use of their own vehicles for business purposes. Salaries of claim adjusters are about one and one-half times the average earnings for all nonsupervisory workers in private industry, except farming; salaries of inside adjusters are slightly above this average.

A survey of life insurance companies by the Life Office Management Association revealed that claim examiners earned average salaries of $11,200 a year in 1974. According to the survey of property and liability companies, casualty claim examiners averaged $13,300. Claim supervisors in casualty companies and life companies averaged between $14,000 and $15,000 and many earned more than $20,000 a year. Claim examiners earn nearly twice as much as the average for all nonsupervisory workers in private industry, except farming.

Claim adjusting is not a desk job. It requires that a person be physically fit because much of the day may be spent in traveling from one place to another, walking about outdoors, and climbing stairs. Adjusters may have to work evenings or weekends in order to interview witnesses and claimants when they are available. Since most companies provide 24-hour claim service to their policyholders, some adjusters always must be on call. (See the statement on the Insurance Industry for additional information on working conditions and employee benefits.)

Claim examiners have desk jobs that require no unusual physical activity. Although the average workweek for examiners is 35 to 40 hours, they may work longer at times of peak claim loads or when quarterly and annual statements are prepared. They also may need to travel occasionally.

Sources of Additional Information

General information about a career as a claim examiner or adjuster is available from the home offices of many life and property and liability insurance companies.

Information about licensing requirements for claim adjusters may be obtained from the department of insurance in each State.

Information about career opportunities in these occupations also may be obtained from:

Insurance Information Institute, 110 William St., New York, N.Y. 10038.

For information about public insurance adjusting, contact:

National Association of Public Adjusters, 1613 Munsey Building, Baltimore, Md. 21202.

Career information on life insurance claim examining is available from:

Institute of Life Insurance, 277 Park Ave., New York, N.Y. 10017.

UNDERWRITERS

(D.O.T. 169.188)

Nature of the Work

Insurance companies assume millions of dollars in risks each year, by transferring chance of loss from their policyholders to themselves. Underwriters appraise and select the risks their company will insure. (The term underwriter sometimes is used in referring to insurance agents; see the statement on Insurance Agents and Brokers elsewhere in the *Handbook* for a discussion of that occupation.)

Underwriters decide whether their companies will accept risks after analyzing information in insurance applications, reports from loss control consultants, medical reports, and actuarial studies (reports that describe the probability of insured loss). Some routine applications that require very little independent judgment are handled by computers. Generally, however, underwriters use considerable personal judgment in making decisions. Because these decisions are seldom reviewed at a higher level, underwriters have great responsibility. Their companies may lose business to competitors if they appraise risks too conservatively or have to pay many future claims if their underwriting actions are too liberal.

When deciding that a policy is an acceptable risk, an underwriter may outline the terms of the contract, including the amount of the premium. Underwriters frequently correspond with policyholders, agents, and managers about policy cancellations or requests for information. In addition, they sometimes accompany salespeople on appointments with prospective customers.

Most underwriters specialize in one of three major categories of insurance: life, property and liability, or health. Life insurance underwriters may further specialize in one type of life insurance or more, such as group or individual policies. The property and liability underwriter specializes by type of risk insured, such as fire, automobile, marine, or workers' compensation. Some underwriters, called commercial account underwriters, handle business insurance exclusively. They often must evaluate a firm's entire operation in appraising its insurance application.

A standard group insurance policy insures all persons in a specified group through a single contract at uniform premium rates; this type of group policy generally provides life or health insurance protection. The

Underwriter analyzes information presented on policy application.

group underwriter analyzes the overall composition of the group to be sure that total risk is not excessive. A different type of group policy finding increasing acceptance is the policy that provides the members of a group—a labor union, for example—with an individual policy geared to their own circumstances. These policies generally are in the casualty field, covering automobiles, pleasure boats, and homes. The casualty underwriter analyzes the application of each group member and makes individual appraisals. Some group underwriters attend meetings with union or employer representatives to discuss the types of policies available to their groups.

Places of Employment

An estimated 20,000 persons worked as insurance underwriters in 1974. Over three-fourths were property and liability underwriters working in regional or home offices throughout the United States; most life insurance underwriters are in home offices in a few large cities, such as Hartford, New York, Chicago, Dallas, and Los Angeles.

Training, Other Qualifications, and Advancement

For beginning underwriting jobs, most insurance companies seek college graduates who have degrees in liberal arts or business administration, but a major in almost any field provides a good general background. Some high school graduates who begin as underwriting clerks may be trained as underwriters after they demonstrate an aptitude for the work.

College graduates usually start as trainees or junior underwriters. They study claim files to learn the factors associated with certain types of losses, and carry out their work assignments under an experienced risk appraiser. Many supplement on-the-job training with courses and instruction at home office schools or local colleges and universities. Many firms pay tuition and the cost of books for those who satisfactorily complete underwriting courses. Some companies offer salary increases as an incentive. Independent study programs are available through the American Institute of Property and Liability Underwriters, the American College of Life Underwriters, the Home Office Life Underwriters Association, the Institute of Home Office Underwriters, and the Life Office Management Association.

Underwriting can be a satisfying career for persons who like working with details and enjoy relating and evaluating information. In addition to analyzing problems, underwriters must make prompt decisions and be able to communicate their ideas to others. They must also be imaginative and aggressive, especially when they have to get additional information from outside sources.

Experienced underwriters who complete study courses may advance to chief underwriter or un-

derwriting manager. Some underwriting managers are promoted to senior managerial jobs after several years.

Employment Outlook

Employment of underwriters is expected to rise about as fast as the average for all occupations through the mid-1980's as insurance sales continue to expand. Each year many jobs will become available as the occupation grows and as those who die, retire, or transfer to other work are replaced.

Several factors underlie the expected growth in the volume of insurance and the resulting need for underwriters. Over the next decade, a much larger portion of our population will enter their most productive years. As this traditional market for life insurance expands, the volume of insurance sales also should rise. This will occur as more individuals purchase life insurance to protect their families' standard of living, finance their childrens' education, or provide retirement income. Property and liability insurance sales also should expand as purchases of automobiles, pleasure boats, and other consumer durables increase. Both spending for new home construction and the American public's growing security consciousness should contribute to demand for more extensive insurance protection. Expanding businesses will need protection for new plants and equipment and insurance for workers' compensation and product liability. Heightened competition among insurance companies and changes in regulations affecting investment profits also are expected to increase the insurance industry's need for competent underwriters.

Earnings and Working Conditions

Underwriters in life insurance averaged $12,500 a year in 1974, according to a Life Office Management Association (LOMA) survey. Senior life underwriters (those with 5 years' experience) averaged $14,300, while senior group underwriters earned average salaries of $14,800. Supervisors of underwriting in life insurance companies averaged $15,000 to $20,000. In most cases, underwriters in larger companies earned higher salaries.

An American Insurance Association-American Mutual Insurance Alliance-National Association of Independent Insurers survey of companies that sell property and liability insurance showed that experienced underwriters averaged $11,300 a year in 1974. Earnings varied substantially by underwriting specialty; senior commercial lines underwriters averaged $13,100, while personal lines underwriters earned average salaries of $10,900. Experienced underwriters earn over 1 1/2 times the average earnings of nonsupervisory workers in private industry, except farming. Underwriting supervisors in property and liability companies averaged $15,100 a year in 1974; many earned over $17,500.

Most underwriters have desk jobs that require no unusual physical activity. Although the average week is 37 hours, underwriters sometimes work overtime. Most insurance companies have liberal vacation policies and other employee benefits. (See the statement on the Insurance Industry for additional information on working conditions and employee benefits.)

Sources of Additional Information

General information about a career as an insurance underwriter is available from the home offices of many life insurance and property and liability insurance companies. Information about career opportunities as an underwriter also may be obtained from:

Institute of Life Insurance, 277 Park Ave., New York, N.Y. 10017.

Insurance Information Institute, 110 William St., New York, N.Y. 10038.

American Mutual Insurance Alliance, 20 N. Wacker Dr., Chicago, Ill. 60606.

ADMINISTRATIVE AND RELATED OCCUPATIONS

Most administrative workers are professional office employees who run, or help run, business and other organizations. Some are managers, who supervise, plan operations and make company policy. Others provide assistance to management, such as personnel workers who recruit and hire staff members and handle employee problems. The success or failure of an organization depends heavily on the way administrative workers do their jobs.

Nearly all administrative jobs require a college degree, although employers vary in the specific area of study they prefer. Some seek business administration or liberal arts graduates; others want a background in technical area such as engineering or science.

Many administrative workers solve problems and make decisions, using numbers and technical data. In addition, these workers must be tactful and able to get along with others. They must be able to handle the uneven flow of work in offices.

This section describes several administrative occupations including City Managers, Accountants, Credit Officials, and Personnel and Labor Relations workers.

ACCOUNTANTS

(D.O.T. 160.188)

Nature of the Work

Managers must have up-to-date financial information to make important decisions. Accountants prepare and analyze financial reports that furnish this kind of information.

Three major accounting fields are public, management, and government accounting. Public accountants have their own businesses or work for accounting firms. Management accountants, also called industrial or private accountants, handle the financial records of the company they work for. Government accountants examine the records of government agencies and audit private businesses and individuals whose dealings are subject to government regulations.

Accountants often concentrate on one particular phase of accounting. For example, many public accountants specialize in auditing (reviewing a client's financial records and reports to judge their reliability). Others specialize in tax matters, such as preparing income tax forms and advising their clients of the advantages and disadvantages of certain business decisions. Still others become specialists in management consulting and give advice on a variety of matters. They might develop or revise an accounting system to serve the needs of clients more effectively or give advice about different types of accounting equipment.

Management accountants pro-

CPA familiarizes himself with plant operations before beginning financial audit.

vide the financial information executives need to make sound business decisions. They may choose to work in areas such as taxation, budgeting, or investments. Internal auditing is an area of specialization within management accounting which is rapidly growing in importance. Accountants who work as internal auditors examine and evaluate their firm's financial systems and management control procedures to ensure efficient and economical operation.

Many accountants in the Federal Government work as Internal Revenue agents, investigators, and bank examiners; other government accountants have regular accounting positions.

Places of Employment

About 805,000 people worked as accountants in 1974; almost 20 percent were Certified Public Accountants (CPA's). About 4 percent of CPA's and nearly 24 percent of all accountants are women. Since the early 1960's, employment of women accountants has increased more rapidly than that of men, and there is every indication that women will continue to play an increasingly active role in the occupation.

About 60 percent of all accountants do management accounting work; one-fifth of these work as internal auditors. An additional 20 percent are engaged in public accounting as proprietors, partners, or employees of independent accounting firms. Other accountants work for Federal, State, and local government agencies, and a small number teach in colleges and universities. Opportunities are plentiful for part-time work in accounting, particularly in smaller firms.

Accountants are found in all business, industrial, and government organizations. Most, however, work in large urban areas where many public accounting firms and central offices of large businesses are concentrated. For example, over 20 percent of all accountants are employed in just four major cities: Chicago, Los Angeles; New York; and Washington, D.C.

Training, Other Qualifications, and Advancement

Training in accounting is available at colleges and universities, accounting and business schools, and correspondence schools. Although many graduates of business and correspondence schools are successful in small firms, most large public accounting and business firms require applicants to have at least a bachelor's degree in accounting or a closely related field. Many employers prefer those with the master's degree in accounting. A strict accounting background usually is not required for starting jobs as internal auditors; however, training in business management, industrial relations, business law, and mathematics is helpful. A growing number of large employers prefer applicants who are familiar with computer technology for both accounting and internal auditor positions. For beginning accounting positions, the Federal Government requires 4 years of college training (including 24 semester hours in accounting or related subjects) or an equivalent combination of education and experience. For teaching positions, most colleges and universities require at least the master's degree or the Certified Public Accountancy Certificate.

Previous work experience in accounting can help an applicant get a job. Many colleges offer students an opportunity to gain experience through internship programs conducted by public accounting or business firms.

Anyone working as a "certified public accountant" must hold a certificate issued by the State board of accountancy. All states use the CPA examination, administered by the American Institute of Certified Public Accountants, to establish certification. Most successful candidates have college degrees, and three-fourths of the States require CPA candidates to be college graduates. Nearly all States require applicants to have at least 2 years of public accounting experience for a CPA certificate.

Requirements vary, but more than half the States restrict the title "public accountant" to those who are licensed or registered. Some States require only a high school diploma while others require 2 years of college or more. Information on requirements may be obtained directly from individual State boards of accountancy or from the National Society of Public Accountants.

The recognized mark of competence and experience in the field of internal auditing is the designation, Certified Internal Auditor (CIA). The Institute of Internal Auditors, Inc. confers this designation upon candidates who have completed 3 years' experience in internal auditing and who have passed a 4-part examination. Beginning in 1978, a bachelor's degree from an accredited college or university also will be required.

Persons planning a career in accounting should have an aptitude for mathematics. Neatness and accuracy also are necessary. Employers seek applicants who can handle responsibility and work with little supervision.

To get to the top in the profession, accountants usually must continue their study of accounting even though they already have college degrees or professional certificates. They may participate in seminars sponsored by various professional associations or take courses offered by their employers. A growing number of States require both CPA's and licensed public accountants to complete a certain number of hours of continuing education courses before their licenses can be renewed. An increasing number of

accountants study computer operation and programming to adapt accounting procedures to new data processing methods. Although capable accountants should advance rapidly, those having inadequate academic preparation may be assigned routine jobs and find promotion difficult.

Junior public accountants usually start by assisting with auditing work for several clients. They may advance to intermediate positions with more responsibility in 1 or 2 years and to senior positions within another few years. In larger firms, those who deal successfully with top industry executives often become supervisors, managers, or partners, or transfer to executive positions in private firms. Some open their own public accounting offices.

Beginning management accountants often start as ledger accountants, junior internal auditors, or as trainees for technical accounting positions. They may advance to jobs such as chief plant accountant, chief cost accountant, budget director, or manager of internal auditing. Some become controllers, treasurers, financial vice-presidents, or corporation presidents. In the Federal Government, beginners are hired as trainees and usually are promoted in a year or so. In college and university teaching, those having minimum training and experience may receive the rank of instructor without tenure; advancement and permanent faculty status depend upon further education and teaching experience.

Employment Outlook

Employment is expected to increase about as fast as the average for all occupations through the mid-1980's as businesses and government agencies continue to expand in size and complexity. In addition to jobs resulting from growth, many thousands of openings will result each year when workers die, retire, or leave the occupation.

Demand for skilled accountants will rise as managers rely more on accounting information to make business decisions. For example, officers of large corporations base their decisions concerning proposals such as plant expansion, mergers, or foreign investments on information about the financial condition of the firm, tax implications of the proposed action, and other considerations. On a smaller scale, owners of small businesses are expected to rely more and more on the expertise of public accountants in planning their operations. Government legislation to monitor business activity also is expected to add to the demand for accountants. An example is the Pension Reform Act of 1974, which establishes minimum standards for private pension plans. This and other legislation should create many new jobs for management accountants to maintain new systems and public accountants to audit them.

Because of the growing complexity of business, college graduates will be in greater demand than applicants who lack this training. Many employers prefer graduates who have worked part time in a business or accounting firm while in school. Those who have been trained in a specific phase of accounting should find ample opportunities.

As data processing systems continue to replace manual preparation of accounting records and statements, the need for some accountants to perform routine tasks, particularly in large firms, may be reduced. However, many opportunities will arise for accountants without a college degree, mainly in small businesses and public accounting firms.

Earnings and Working Conditions

Starting salaries of beginning accountants in private industry were $9,700 a year in 1974, according to a survey in urban areas. Earnings of experienced accountants ranged between $13,300 and $19,600, depending on their level of responsibility and the complexity of the accounting system. In general, experienced accountants earn about twice as much as nonsupervisory workers in private industry, except farming. Chief accountants who direct the accounting program of a company or one of its establishments earned between $17,600 and $29,000, depending upon the scope of their authority and size of professional staff.

According to the same survey, beginning auditors averaged $10,400 a year, while experienced auditors' earnings ranged between $14,400 and $17,500.

Salaries generally are higher for accountants who travel a great deal or who hold a graduate degree or a CPA certificate.

In the Federal Civil Service, the entrance salary for junior accountants and auditors was about $10,200 in late 1974. Candidates who had superior academic records received a starting salary of about $11,200. Applicants with a master's degree or 2 years' professional experience began at about $12,800. Accountants in the Federal Government averaged about $23,000 a year in 1974.

Accountants who specialize in income tax preparation often work long hours under heavy pressure during the tax season; those employed by national accounting firms may travel extensively to conduct audits and perform other services for their clients. The majority, however, work in one office between 35 and 40 hours a week, under the same general conditions as fellow office workers.

Sources of Additional Information

Information about CPA's and

about aptitude tests in high schools, colleges, and public accounting firms may be obtained from:

American Institute of Certified Public Accountants, 666 Fifth Ave., New York, N.Y. 10019.

Further information on specialized fields of accounting is available from:

National Association of Accountants, 919 Third Ave., New York, N.Y. 10022.

National Society of Public Accountants, 1717 Pennsylvania Ave. NW., Washington, D.C. 20006.

Institute of Internal Auditors, 5500 Diplomat Circle, Orlando, Fla. 32810.

ADVERTISING WORKERS

(D.O.T. 050.088; 132.088; 141.081 and .168; 162.158; and 164.068 through .168)

Nature of the Work

Almost every business does some form of advertising to pursuade people to buy its products or use its services. A wide variety of workers in many industries create and produce advertisements, or make arrangements for them to be broadcast on radio and television or published in newspapers and magazines. The following occupations are those most commonly associated with advertising.

Advertising managers direct the advertising program of the businesses for which they work. They determine the size of the advertising budget, the type of ads and media to be used, and the advertising agency, if any, that will be employed. Managers who decide to employ an agency work closely with the account executives assigned to their firms. They also may supervise the preparation of pamphlets, brochures, or other materials developed to promote the firm's products or services. Advertising managers working for newspapers, radio stations, and other communications media have somewhat different duties. They are responsible for selling advertising time or space, and their work is similar to that of sales managers in other businesses.

Account executives are employed by advertising agencies to develop advertising programs for clients. They study the client's sales, public image, and advertising problems and create a program that meets the client's approval. In most agencies, the actual artwork and slogans are developed by artists and copywriters, but in some small agencies, account executives are responsible for this aspect of the job. Account executives may be supervised by account supervisors; usually, however, they report directly to agency heads.

Research directors and their assistants study the market for the product or service being sold. They review its possible uses, advantages or disadvantages compared to those of competitors, and ways of reaching potential buyers. These workers may survey buying habits and motives of customers, or try out sample advertisements to find the selling theme or medium that best sells the product. (See the statement on Marketing Research Workers for more information on this occupation.)

Advertising copywriters develop the slogans and text to be used in the ads. By studying information about the product and its potential customers, they are able to write copy aimed at the particular group of customers the advertiser seeks to attract. They may specialize in writing copy for certain groups, such as business managers, teenagers, or sports lovers, or for a class of products, such as cars or computer equipment. Copywriters usually work closely with account executives. In some agencies they may be supervised by copy chiefs.

Artists and *layout workers* create the visual impact of an advertisement by selecting photographs, drawing symbols or figures, and selecting the size or type of print to be used in a magazine or newspaper ad. When television commercials are planned, they usually sketch sample scenes for the client to consider. (See the statements on Commercial Artists and Photographers for more information on this type of work.)

Media directors (or *space buyers* and *time buyers*) negotiate contracts for advertising space or air time. They determine, for example, the day and time when a television commercial would reach the largest group of prospective buyers at the least cost. To select the best medium for the advertiser, they must know the costs of using various media and the characteristics of the audience that would be reached by specific publications or television stations.

Production managers and their assistants arrange to have the ad printed for publication or filmed for television use. They must know which firms or freelance workers will be able to produce the best ad for the least cost.

Places of Employment

In 1974, about 170,000 people worked in jobs requiring considerable knowledge of advertising. More than one-third were employed in advertising agencies, largely concentrated in New York City and Chicago.

The rest worked for a variety of firms and industries. Many advertising workers are employed directly by organizations with products or services to sell, such as manufacturers and retail stores. Others work for television or radio stations, newspapers, and magazines and sell air time or space to advertisers. Some work for printers, art studios, and package design firms that help advertisers create their ads.

Training, Other Qualifications, and Advancement

Most employers prefer college graduates who have liberal arts

Layout worker designs a newspaper ad for a department store sale.

training or majors in advertising, marketing, journalism, or business administration. No particular educational background, however, is equated with success in advertising. Preparing or selling ads for school publications or a summer job with a marketing research service can be helpful experience.

Some large organizations recruit outstanding college graduates for training programs that cover all aspects of advertising work. Some beginners start as research or production assistants or as space or time buyers. A few begin as junior copywriters.

Many advertising jobs require imagination, creativity, and a flair for language. Persons interested in becoming advertising managers, account executives, media buyers, and production managers must be able to get along well with people and be able to sell their ideas. Research directors and their assistants must have an understanding of human behavior. Creativity is especially important to artists, layout workers, and account executives. Advertising workers must be able to accept criticism of their work and be able to function as part of a team.

Copywriters and account executives may advance to more responsible work in their specialties, or to managerial jobs, if they demonstrate ability in dealing with clients. Some who are especially capable may become partners in an existing agency, or establish their own.

Employment Outlook

Employment of advertising workers is expected to increase about as fast as the average for all occupations through the mid-1980's, as the growing number of consumer goods and increasing competition in some product or service markets cause advertising expenditures to rise. Employment in these occupations is strongly affected by general business conditions because firms expand or contract their advertising budgets according to their financial success. Although opportunities should be favorable for highly qualified applicants, others seeking entry jobs will face keen competition because many persons are attracted to the field. Most openings will result from the need to replace workers who die, retire, or leave the occupation for other reasons.

Earnings and Working Conditions

According to the limited information available, annual salaries for beginning advertising workers with bachelor's degrees ranged from $8,000 to $10,000 in 1974. The higher starting salaries generally were paid by the largest firms or advertising agencies to outstanding applicants.

Salaries of experienced advertising workers employed by agencies varied by size of firm and type of job. For example, account executives averaged $18,000 to $25,000 a year and media directors, $20,000, according to limited information. Copywriters' salaries ranged from $15,000 for beginners to as much as $50,000 for those having print and television experience.

People in advertising work under great pressure. They are expected to produce quality ads in as short a time as possible. Sometimes they must work long or irregular hours in order to meet deadlines or make last-minute changes. Account executives, copywriters, and layout workers may become frustrated by a client's inability to define the type of ad he or she wants for a product.

Advertising can be a satisfying career for persons who enjoy variety, excitement, creative challenges, and competition. Unlike workers in many other occupations, advertising workers experience the satisfaction of having their work in

print, on television, or on radio, even though they remain unknown to the public at large.

Sources of Additional Information

Information on advertising agencies and the careers they offer is available from:

American Association of Advertising Agencies, 200 Park Ave. New York, N.Y. 10017.

For a list of schools that provide training in advertising, contact:

American Advertising Federation, 1225 Connecticut Ave. NW., Washington, D.C. 20036.

BUYERS

(D.O.T. 162.158 and 185.168)

Nature of the Work

Buyers determine which products are on display in retail stores. Although all buyers seek to satisfy their stores' customers and sell at a profit, the kind and variety of goods they purchase depend on the store where they work. A buyer for a small clothing store, for example, may purchase its complete stock of merchandise from sportswear to formal evening clothes. Buyers who work for larger retail businesses often handle one or a few related lines of goods, such as men's wear, ladies' sportswear, or children's toys. Some, known as *foreign buyers*, purchase merchandise outside the United States.

In order to purchase the best selection of goods for their stores, buyers must be familiar with the manufacturers and distributors who handle the merchandise they need. They also must keep informed about changes in existing products and the development of new ones. To learn about merchandise, buyers attend fashion and trade shows and visit manufacturers' showrooms. They usually order goods during buying trips, and also place orders with wholesale and manufacturers' salesworkers who call on them to display their merchandise.

Buyers must be able to assess the resale value of goods after a brief inspection and make a purchase decision quickly. They are aware of their stores' profit margins and try to select merchandise that will sell quickly at well above the original cost. Since most buyers work within a limited budget, they must plan their purchases to keep needed items always in stock but also allow for unexpected purchases when a "good buy" presents itself.

Because buyers purchase merchandise for their firms to resell (unlike purchasing agents who buy goods for direct use by the firm—see the statement on Purchasing Agents elsewhere in the *Handbook*), they must know what motivates customers to buy. Before ordering a particular line of merchandise, buyers study market research reports and analyze past sales records to determine what products are currently in demand. They also confer with assistant buyers and sales clerks whose daily contact with customers furnishes information about consumer likes and dislikes. In addition, buyers read fashion and trade magazines to keep abreast of style and manufacturing trends; follow ads in newspapers and other media to check retail competitors' sales activities; and watch general economic conditions to anticipate consumer buying patterns.

Merchandise managers (D.O.T. 185.168) plan and coordinate buying and selling activities for large and medium-sized stores. They divide the budget among buyers, decide how much merchandise to stock, and assign each buyer to purchase certain goods. Merchandise managers may review buying decisions to insure that needed categories of goods are in stock, and help buyers to set general pricing guidelines.

Buyers and merchandise managers usually have very busy schedules and deal with many different people in the course of a day. They work with manufacturers' representatives, other store personnel including store executives and salesworkers, and customers. Assisting with sales promotions and creating enthusiasm among sales personnel are part of the buyer's job, and he or she may be asked to provide information such as dress sizes and product descriptions to the advertising department for a sales promotion, or to meet with floor salesworkers before a new line of merchandise is introduced. Some buyers direct assistants who handle routine aspects of purchasing such as verifying shipments; others supervise department managers.

Some buyers represent large stores or chains in cities where many manufacturers are located. The duties of these "market representatives" vary by employer; some purchase goods, while others supply information and arrange for store buyers to meet with manufacturers when they are in town.

Places of Employment

In 1974, almost 110,000 buyers and merchandise managers worked

Linen buyer in a large department store discusses special order with a customer.

for retail firms—half of them for clothing and general department stores.

About 2 out of every 5 people in the occupation were women.

Although jobs for buyers are found in all parts of the country, most jobs are in major metropolitan areas were retail stores are concentrated. Market representatives work for buying offices in major market areas such as New York, Chicago, and Dallas.

Training, Other Qualifications, and Advancement

A job which traditionally has attracted career-minded people, buying offers good opportunities to begin a career in merchandising.

Most retail stores prefer college or junior college graduates for buying jobs. Courses in merchandising or marketing may help in getting a first job, but most employers accept graduates in any field of study and train them on the job. Promising salesworkers sometimes are considered for promotion to jobs at the management level, and begin as assistant buyers.

Many stores have formal training programs for all management or executive trainees, including buyers. These programs usually last from 6 to 8 months and combine classroom instruction in merchandising and purchasing with short rotations to various jobs in the store. This training introduces the new worker to store operations and policies, and provides the fundamentals of merchandising and management as well.

The trainee's first job is likely to be that of assistant buyer. The duties include supervising salesworkers, checking invoices on material received, and keeping account of stock on hand. Assistant buyers gradually assume purchasing responsibilities, depending upon their individual abilities and the size of the department where they work. Training as an assistant buyer usually lasts about a year. After about 5 years of working as a buyer, those who show exceptional ability may advance to merchandise manager. A few find further promotion to top executive jobs such as general merchandise manager for a retail store or chain. The length of time it takes to reach any of these levels depends not just on the individual's ability but on the store's need for management personnel. The faster growing the company, the more opportunity there is for a worker to acquire responsibility.

Buyers should be good at planning and decisionmaking and have an interest in merchandising. They need leadership ability and communications skills to supervise salesworkers and assistant buyers and to deal effectively with manufacturers' representatives and store executives. Because of the fast pace and constant pressure of their work, buyers need physical stamina and emotional stability.

Employment Outlook

Employment of buyers is expected to grow faster than the average for all occupations through the mid-1980's, as retail stores seek to promote sales by offering their customers a broader selection of goods. In addition to opportunities created by this growth, many job openings will arise each year from the need to replace workers who leave the occupation. Competition for these jobs is expected to be keen, for merchandising attracts large numbers of college graduates every year. Prospects are likely to be best for qualified applicants who enjoy the competitive nature of retailing, and work best in a demanding, fast-paced job.

Employment of buyers will grow as retailers put greater emphasis on the selection, display, and promotion of the goods they have for sale. This is likely to spur demand for buyers with the professional expertise to discover new sources of merchandise and select goods that will appeal to customers and make a profit for the retailer. The demand for astute buyers and merchandise managers will grow even though chain stores and other large firms are centralizing their purchasing functions and turning to the computer for routine buying and for compiling and tabulating data on past sales.

Earnings and Working Conditions

Newly hired buyers who were college graduates started at $8,300 to $9,000 a year in 1974. Some who showed unusual promise started at annual salaries of $12,000 or more.

Earnings, which frequently include a bonus in addition to regular salary, vary according to the sales volume of the store and the type of merchandise purchased. Buyers in single-store companies with yearly sales of $5-15 million earned about $10,500 in 1974; merchandise managers in these stores averaged nearly $24,000.

Buyers for discount department stores and other mass merchandising firms are among the most highly paid in the industry. Those working for mass merchandising firms with annual sales of $40-400 million earned over $21,000 in 1974, while merchandise managers earned about $36,000. A 1972 survey conducted by the Mass Retailing Institute shows that in firms with annual sales of $4 million or more, average earnings for buyers ranged from about $16,000 to $24,000, depending on the type of merchandise purchased; most buyers earned between $19,000 and $21,000. Merchandise managers made considerably more.

Buyers regulate their own hours, and often work more than 40 hours a week because of sales, conferences, and travel. The amount of traveling a buyer does varies with the type of merchandise bought and the location of suppliers, but most

spend 4 or 5 days a month on the road. Merchandise managers also travel frequently, averaging several trips a month in many cases.

Sources of Additional Information

General information about a career in retailing is available from:

National Retail Merchants Association, 100 West 31st St., New York, N.Y. 10001.

Mass Retailing Institute, 570 Seventh Ave., New York, N.Y. 10018.

CITY MANAGERS

(D.O.T. 188.118)

Nature of the Work

Population growth and industrial expansion place increasing pressure on housing, transportation, and other facilities of cities. Problems associated with growing modern communities, such as air and water pollution and rising crime rates, also demand attention. To cope effectively with these problems, many communities hire a specialist in management techniques—the city manager.

A city manager is responsible to the community's elected officials who appoint him. Although duties vary by city size, city managers generally administer and coordinate the day-to-day operations of the city. They are responsible for functions such as tax collection and disbursement, law enforcement, and public works; hire department heads and their staffs; and prepare the annual budget to be approved by elected officials. They also study current problems, such as traffic congestion, crime, or urban renewal, and report their findings to the elected council.

City managers must plan for future growth and development of cities and surrounding areas. To provide for an expansion of public services, they frequently appear at civic meetings to advocate certain programs or to inform citizens of current government operations.

City managers work closely with planning departments to coordinate new and existing programs. In smaller cities that have no permanent planning staff, coordination may be assumed entirely by the manager.

Many cities employ assistant city managers, department head assistants, and administrative assistants to aid city managers. Under the manager's direction, they administer programs, prepare reports, receive visitors, answer correspondence, and generally help to keep the city functioning smoothly. Assistant city managers organize and coordinate city programs, supervise city employees, and act for the city manager in their absence. They also may assume responsibility for some projects, such as the development of a preliminary annual budget. Department head assistants generally are responsible for one activity, such as personnel, finance, or law, but also may assist in other areas. Administrative assistants, also called executive assistants or assistants to the city manager, usually do administrative and staff work in all departments under the city manager. For instance, they may compile operating statistics, or review and analyze work procedures.

Places of Employment

About 2,900 city managers were employed in 1974. Although nearly all of them were men, in recent years a growing number of women have entered the occupation. In addition, several thousand persons

City manager and staff discuss urban renewal plans with community group.

worked as administrative assistants, department head assistants, and assistant city managers. Most city managers worked for cities and counties having a council-manager form of government, in which the council appoints a manager who is responsible for the day-to-day operation of the government as well as for the hiring and firing of assistants, department heads, and other staff. Most of the remainder worked in municipalities having other forms of government, such as mayor-council government in which the mayor appoints the city manager as his administrative assistant or chief administrative officer. A few city managers also worked for metropolitan or regional planning organizations and councils of governments.

Although over three-quarters of all city managers work for small cities having 25,000 or less inhabitants, many larger cities also employ a city manager. About half of the cities having a population of between 10,000 and 500,000 have city managers. City managers work in all States, but one-half are concentrated in the eastern part of the Nation.

Training, Other Qualifications, and Advancement

A master's degree, generally in public or business administration, is becoming increasingly important for those seeking a career in city management. Although some applicants with only a bachelor's degree may find employment, strong competition for positions, even among master's recipients, will make the graduate degree a requirement for most entry level jobs. In some cases, employers may hire a person with training in a field related to public administration, such as engineering, recreation, social work, or political science.

In 1974, over 150 colleges and universities offered graduate degree programs in public or municipal administration. Degree requirements in some schools include successful completion of an internship program in a city manager's office. During this internship period, which may last from 6 months to a year, the degree candidate observes local government operations and does research under the direct supervision of the city manager.

Most new graduates work as administrative assistants to city managers for several years and gain experience in solving urban problems, coordinating public services, and management techniques. Others work in an area of government operations such as finance, public works, or public planning. They may acquire supervisory skills and additional experience by working as assistant city manager or department head assistant in operations. City managers often are first employed in small cities, but during their careers, they may work in several cities of increasing size.

Young persons who plan a career in city management should like to work with detail and as part of a team. They must have sound judgment, self-confidence, and be able to perform well under stress. To handle emergency situations, city managers must quickly isolate problems, identify their causes, and provide alternate solutions. City managers should be tactful and able to communicate with and work well with people.

City managers also must be dedicated to public service since they often put in long, hard hours in times of crises.

Employment Outlook

This small occupation is expected to expand faster than the average for all occupations to the mid-1980's as problems of our growing cities become more complex. Examples of more sophisticated ways of dealing with these problems include computerized data collection of police information, advances in technology of traffic control, and the application of systems analysis to urban problems. The demand for city managers also will increase as cities convert to the council-manager form of government, currently the fastest growing form of city government. Furthermore, city managers will be needed in places having other forms of government to help elected officials cope with day-to-day operations of government.

Persons who seek beginning city management jobs as administrative assistants, department head assistants, or assistant city managers may face strong competition through the mid-1980's, especially if they do not have a graduate degree in public administration or related management experience. However, many of those unable to find employment in this area should find jobs in other fields of public administration. Competition should be keen among the growing number of administrative assistants, department head assistants, and assistant city managers for the relatively few city manager positions.

Earnings and Working Conditions

Salaries of city managers and their assistants vary according to their education and experience as well as job responsibility and size of city. Generally, city managers' earnings are very high relative to the average earnings for nonsupervisory workers in private industry, except farming. In 1974, annual salaries of city managers ranged from about $12,000 in cities of 5,000 to more than $40,000 in cities of over 250,000, according to the International City Management Association. The average annual salary for all city managers is almost $20,000. City managers in cities not having council-manager governments received slightly less.

Salaries of assistant city managers and department head

assistants ranged from about $10,000 in small cities to more than $25,000 in large ones. They were generally paid about three-fourths the salaries paid city managers. Administrative assistant salaries typically ranged from $8,500 to $10,000, annually.

City managers often work more than 40 hours a week. Emergency problems may require evening and weekend work and meetings with individuals and citizen's groups consume additional time.

Fringe benefits usually include health and life insurance programs, pension plans, sick leave, vacation time, and often a car for official business. Managers generally are reimbursed for expenses incurred while attending professional meetings and seminars.

Sources of Additional Information

For information on a career in city management, contact:

International City Management Association, 1140 Connecticut Ave. NW., Washington, D.C. 20036.

For further information on the council manager form of government, contact:

National Municipal League, 47 E. 68th St., New York, N.Y. 10021.

COLLEGE STUDENT PERSONNEL WORKERS

(D.O.T. 045.108, 090.118, 090.168, 129.108, and 166.168)

Nature of the Work

A student's choice of a particular institution of higher education for further study is influenced by many factors. Availability of a specific educational program, quality of the school, and cost, as well as proximity to home, may all play important roles.

For many students, an equally important factor is the institution's ability to provide for their housing, social, cultural, and recreational needs. Development and administration of these services, including educational and similar programs, provide a wide variety of jobs for college student personnel workers. The admissions officer, registrar, the dean of students, and the career planning and placement counselor are probably the best known among these. Some other types of workers that may make up this broad occupational field are student activities and college union personnel, student housing officers, counselors in the college counseling center, financial aid officers, and foreign student advisers.

Titles of student personnel workers vary from institution to institution and from program to program within a single school. Titles also vary with the level of responsibility within a certain student personnel program. The more common titles include dean, director, officer, associate dean, assistant director, and counselor.

The *dean of students*, or the vice president for student affairs, heads the student personnel program at a school. Among his or her duties is evaluating the changing needs of the students and helping the president of the college develop institutional policies. The dean of students generally coordinates a staff of associate or assistant deans; these are in charge of the specific programs that deal directly with the students.

At some schools, the admissions office and the records office are separate. *Admissions counselors* interview and evaluate prospective students and process their applications. They may travel extensively to recruit high school, junior college, and older students and to acquaint them with opportunities available at their college. They work closely with faculty, administrators, financial aid personnel, and public relations staff to determine policies for recruiting and admitting students. Personnel in the office of the *registrar* maintain the academic records of students, and provide current enrollment statistics for communication both within the college and between the college and the community.

Student financial aid personnel assist students in obtaining financial support to pay for their education. Workers in this field must keep well informed about sources of financial aid, funding, and about management of all forms of financial aid—scholarships, grants, loans, student employment, fellowships, teaching and research assistantships. They work closely with administrators and with the admissions, counseling, business, and academic office staffs.

Career planning and placement counselors, sometimes called college placement officers, assist students in making long-range career selections and may also help students get part-time and summer jobs. On many campuses, they arrange for prospective employers to visit the school to discuss their firm's personnel needs and to interview applicants. (For further information on this field, see statement on College Career Planning and Placement Counselors.)

The student personnel staff in charge of *student activities* work with members of proposed and established student organizations, especially with student government. They help the student groups to plan, implement, and evaluate their activities. Often, the student activities staff will assist in the orientation of new students.

College union staff members work with students to provide intellectual, cultural, and recreational programs. Many college union staff members are responsible for directing the operation of the physical facilities and services of the building, such as food and recreational services, building maintenance, fiscal planning, conference facilities, and employee supervision.

Student housing officers sometimes live in the dormitories and, in general, help the students to live together in harmony. They may serve as counselors to individual students with personal problems. Housing officers also may be involved in managing the fiscal, food service, and housekeeping operations of student residences.

Counselors help students with personal, educational, and vocational problems. Students may come to the counselors on their own or be referred by a faculty member, a residence hall counselor, or a friend. Counseling needs may arise from lack of self-confidence or motivation on the part of the student, failure in academic work, desire to leave college or transfer to another college, inability to get along with others, loneliness, drug abuse, or marriage problems. In addition, there is a growing trend for counselors to try to reach more students by establishing group sensitivity sessions and telephone "hotlines." Counselors often administer tests that indicate aptitudes and interests to students having trouble understanding themselves. Some also teach in the college or assist with admissions, orientation, and training of residence hall staff. (For further information on this field, see statement on Psychologists.)

Foreign student advisers administer and coordinate many of the services which are crucial in insuring a successful academic and social experience for students from other countries. They usually assist with foreign student admissions, orientation, financial aid, housing, English as a foreign language, academic and personal counseling, student-community relationships, placement, and alumni relations. In addition they may be an adviser for international associations and nationality groups and for U.S. students interested in study, educational travel, work, or service projects abroad.

Places of Employment

An estimated 50,000 college student personnel workers, roughly one-third of them women, were employed in 1974. Every college and university, whether a 2-year or a 4-year school, has a staff performing student personnel functions. They are not always organized as a unified program. Large colleges and universities generally have specialized staffs for each personnel function. However, in many small colleges a few persons may carry out the entire student personnel program.

Training, Other Qualifications, and Advancement

Because of the diversity in duties, the education and backgrounds of college student personnel workers vary considerably. A bachelor's degree is the minimum requirement; however, for some student personnel programs it is necessary to have a master's degree, and others in the field have doctoral degrees.

In 1974, more than 100 colleges and universities offered graduate programs in student personnel work. However, many employers prefer instead a graduate degree in a specific academic field added to some courses in student personnel work. A master's degree in clinical or counseling psychology is usually required for work as a college counselor. This degree also is helpful in other student personnel fields such as career planning and placement. Business administration also is helpful, especially for those who wish to go into the admissions, records, college union, financial aid, or student housing fields. Familiarity with data processing is an asset especially for work in admissions, records, or financial aid. Social science and recreation degrees also are useful, as is work experience in business, government, or educational associations. The majority, however, have degrees in education or the social sciences.

College student personnel workers must be interested in, and able to work with, people of all backgrounds and ages. They must have the patience to cope with conflicting viewpoints of students, faculty, and parents. People in this field often deal with the unexpected and the unusual; therefore emotional stability and the ability to function while under pressure are necessities.

Entry level positions are usually those of student activities advisers, admissions counselors, financial aid counselors, residence hall directors, and assistants to deans. Persons without graduate degrees may find advancement opportunities limited. A doctorate is usually necessary for the top student personnel positions.

Employment Outlook

The employment outlook of college student personnel workers is likely to be somewhat competitive through 1985. Employment is expected to remain relatively stable. Tightening budgets, in both public and private colleges and universities, is the chief factor underlying this expected lack of growth in em-

ployment. Student personnel positions least likely to be affected if some reduction in number becomes necessary are those most closely tied to the academic function of the school—admissions, financial aid, and records. Over the short run, until colleges and universities resolve their financial difficulties, most openings each year will result from the need to replace personnel who transfer to other positions, retire, or leave the field for other reasons.

During the early 1980's, however, employment of student personnel workers is expected to increase as colleges provide more services for students, especially the growing number from low-income and minority families who often require special counseling and assistance. The increasing number of college students, in junior and community colleges, is a factor which also could contribute to some growth in the student personnel occupations, especially if financial problems should ease. Two-year public colleges, for the most part, have less serious financial problems because, unlike most 4-year institutions, their enrollments are growing and their operating costs are moderate.

Earnings and Working Conditions

Median salaries of *chief student affairs officers* ranged from $13,700 in small private colleges to $29,900 in large public universities in 1974, according to a National Education Association survey of public and private colleges and universities. Median salaries of *deans of admissions* ranged from $12,700 to $22,300; for *registrars*, from $9,400 to $20,400. *Directors of student testing and counseling* had median salaries of $11,400 to $22,800. The median salaries of the other student personnel workers were somewhat lower. New entrants to the field received about $8,500 in 1974.

College student personnel workers frequently work more than a 40-hour week; often irregular hours and overtime work are necessary. Employment in these occupations is usually on a 12-month basis. In many schools, they are entitled to retirement, group medical and life insurance, and sabbatical and other benefits.

Sources of Additional Information

A pamphlet, *Careers in Higher Education*, is available from:

The American Personnel and Guidance Association, 1607 New Hampshire Ave. NW., Washington, D.C. 20009.

CREDIT MANAGERS

(D.O.T. 168.168)

Nature of the Work

Both businesses and individuals may require credit to meet their daily needs for a variety of goods and services. In most forms of credit granting, a credit manager has final authority over the decision to accept or reject a credit application.

In extending credit to a business (commercial credit), the credit manager, or an assistant, analyzes detailed financial reports submitted by the applicant, interviews a representative of the company about its management, and reviews credit agency reports to determine the firm's record in repaying debts. The manager also checks at banks where the company has deposits or previously was granted credit. In extending credit to individuals (consumer credit), detailed financial reports usually are not available. The credit manager must rely more on personal interviews, credit bureaus, and banks to provide information about the person applying for credit.

Particularly in large organizations, executive level credit managers are responsible for formulating a credit policy. They must establish financial standards to be met by applicants and thereby determine the amount of risk that their company will accept when offering its products or services for sale on credit. Managers usually cooperate with the sales department in developing a credit policy liberal enough to allow the company's sales to increase and yet strict enough to deny credit to customers whose ability to repay their debts is questionable. Many credit managers establish office procedures and supervise workers who gather information, analyze facts, and perform general office duties in a credit department; they include application clerks, collection workers, bookkeepers, and secretaries.

In smaller companies that handle a limited number of accounts, credit managers may do much of the work of granting credit themselves. They may interview applicants, analyze the information gained in the interview, and make the final lending decision. They frequently must contact customers who are unable or refuse to pay their debts. They do this through writing, telephoning, or personal contact. If these attempts at collection fail, credit managers may refer the account to a collection agency or assign an attorney to take legal action.

Places of Employment

About 66,000 persons, nearly a third of them women, worked as credit managers in 1974. About one-half were employed in wholesale and retail trade, but many others, almost one-third of the total, worked for manufacturing firms and financial institutions.

Although goods and services are sold on credit, and cash loans granted, throughout the United States, most credit managers work

in urban areas where many financial and business establishments are located.

Training, Other Qualifications, and Advancement

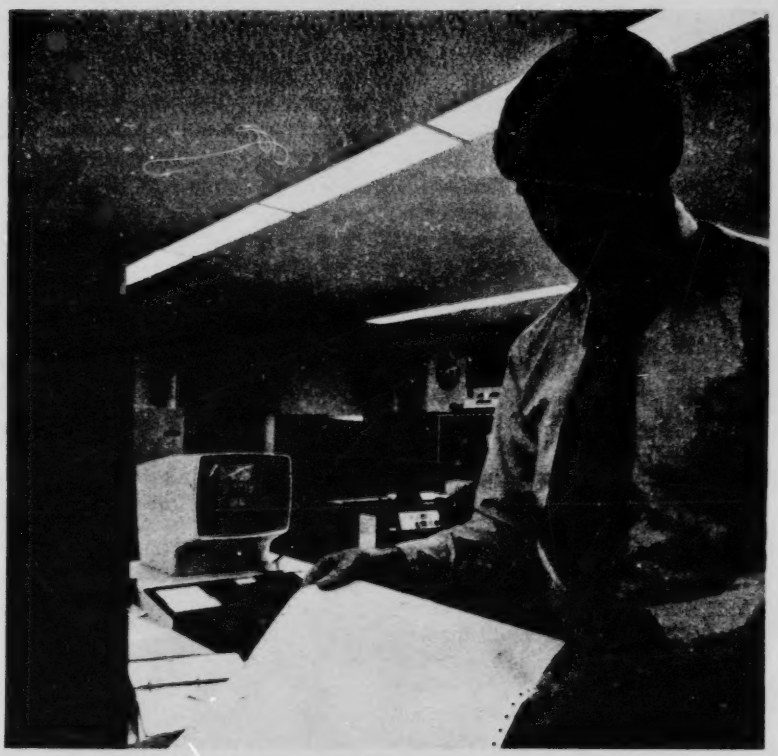
A college degree is becoming increasingly important for entry level jobs in credit management. Employers usually seek persons who have majored in business administration, economics, or accounting, but may also hire graduates holding liberal arts degrees. Some employers promote high school graduates to credit manager positions if they have experience in credit collection or processing credit information.

Newly hired workers normally begin as management trainees and work under the guidance of more experienced personnel in the credit department. Here they gain a thorough understanding of the company's credit procedures and policies. They may analyze previous credit transactions to learn how to recognize which applicants should prove to be good customers. Trainees also learn to deal with credit bureaus, banks, and other businesses that can provide information on the past credit dealings of their customers.

Many formal training programs are available through the educational branches of the associations that serve the credit and finance field. This training includes home study, college and university programs, and special instruction to improve beginners' skills and keep experienced credit managers aware of new developments in their field.

A person interested in a career as a credit manager should be able to analyze detailed information and draw valid conclusions based on this analysis. Because it is necessary to maintain good customer relationships, a pleasant personality and the ability to speak and write effectively also are characteristics of the successful credit manager.

The work performed by credit managers allows them to become familiar with almost every phase of their company's business. Highly qualified and experienced managers can advance to top-level executive positions. However, in small and medium-sized companies, such opportunities are limited.



Manager trainee reviews previous credit transactions.

Employment Outlook

Credit management is an expanding field. Through the mid-1980's employment is expected to grow faster than the average for all occupations. In addition to opportunities created by this growth, many jobs will open each year from the need to replace persons who leave the occupation. Although there will be employment opportunities throughout the country, prospects should continue to be best for well-qualified jobseekers in metropolitan areas.

The volume of credit extended rose very rapidly during the past decade. In the years ahead, businesses can be expected to require increasing amounts of credit to secure raw materials for production and obtain finished goods for eventual resale. Consumers, whose personal incomes have risen, are expected to finance greater numbers of high-priced items. In addition, the use of credit for everyday purchases is expected to grow as demand increases for recreation and household goods as well as a wide range of consumer services.

Although the increasing use of computers for storing and retrieving information will allow individual credit managers to serve more customers, this should not slow the growth of the occupation. As companies handle greater numbers of credit transactions, credit

managers will spend more time managing and supervising the credit handling process in their firms. Moreover, many duties of credit managers, such as customer counseling and interviewing applicants, demand the tact and good judgment only personal contact can provide.

In addition, attractive credit terms are a major tool for increasing the sales volume of almost any business. As firms strive to maximize their sales in the face of competition, there will be a greater demand for skilled credit managers who can establish credit policies strict enough to minimize bad debt losses.

Earnings and Working Conditions

In 1974, beginning credit managers earned annual salaries that ranged from about $7,500 to over $10,000, depending on the type of employer and the geographic location of the job.

As credit managers gain experience and reach middle management positions, their earnings usually range from $10,000 to $20,000 a year; with the largest employers, earnings may be as high as $25,000 or more. Some individuals in top-level positions earned salaries well over $40,000 a year.

Credit managers normally work the standard workweek of their company—35-40 hours, but some work longer hours. In wholesale and retail trade, for example, a seasonal increase in credit sales can produce a greater work volume. In addition, some credit managers attend conferences sponsored by industry and professional organizations where managers meet to develop and discuss new techniques for the management of a credit department.

Sources of Additional Information

Information about training programs available in consumer credit may be obtained from:

Society of Certified Consumer Credit Executives, 7405 University Dr., St. Louis, Mo. 63130.

For information about training programs available in commercial credit, write:

Credit Research Foundation, 3000 Marcus Ave., Lake Success, N.Y. 11040.

HOTEL MANAGERS AND ASSISTANTS

(D.O.T. 163.118 and 187.118, .168)

Nature of the Work

Hotel managers are responsible for operating their establishments profitably and satisfying guests. They determine room rates and credit policy, direct the operation of the kitchen and dining rooms, and manage the housekeeping, accounting, and maintenance departments of the hotel. They also are responsible for solving any problems that may arise.

Managers who work in small hotels may do much of the front office clerical work, such as taking room reservations and assigning rooms. In some small hotels and many motels, the manager is also the owner and may be responsible for all aspects of the business.

General managers of large hotels usually have several assistants who manage various parts of the operation. Because the hotel restaurant and cocktail lounge are important to the success of the entire establishment, they almost always are operated by managers with experience in the restaurant field. Other areas that usually are handled separately are advertising, rental of banquet and meeting facilities, personnel, and accounting.

Large hotel and motel chains often centralize some activities, such as purchasing and advertising, so that individual hotels in the chain may not need managers for these departments. Managers who work for chains may be assigned to organize a newly built or purchased hotel or to reorganize an existing hotel or motel that is not operating successfully.

About 120,000 hotel and motel managers, one-third of them women, were employed in 1974. More than a third were self-employed.

Training, Other Qualifications, and Advancement

Although experience is generally the most important consideration in selecting managers, employers increasingly emphasize college education. Many believe that acquiring a 4-year college degree in hotel and restaurant administration is the best educational preparation. The courses in hotel work that are available in a few junior colleges and through the American Hotel and Motel Association also are considered helpful.

A college program in hotel management usually includes courses in hotel administration, accounting, economics, food service management and catering, and hotel maintenance engineering. Students are encouraged to work in hotels or restaurants during summer vacations because the experience gained and the contacts made with employers may help them to get better hotel jobs after graduation.

Managers should have initiative, self-discipline, and the ability to organize work and direct the work of others. They must be able to concentrate on details and solve problems.

Some large hotels have special on-the-job management trainee programs in which trainees rotate among various departments to acquire a thorough knowledge of the hotel's operation. Outstanding employees who have not had col-

Hotel manager personally greets an association representative who is considering his hotel as a convention site.

lege training may receive financial assistance to help them acquire a degree.

Most hotels promote employees with proven ability, usually front office clerks, to assistant manager and eventually to general manager. Hotel chains may offer better opportunites for advancement than independent hotels, because employees can transfer to another hotel in the chain or to the central office if an opening occurs.

Employment Outlook

Employment of hotel managers is expected to grow about as fast as the average for all occupations through the mid-1980's as additional hotels and motels are built and chain and franchise operations spread. Many openings also will occur as experienced managers die, retire, or transfer to other jobs. Applicants having college degrees in hotel administration will have an advantage in seeking entry positions and later advancement.

See the statement on the Hotel Industry elsewhere in the *Handbook* for information on earnings and working conditions, sources of additional information, and more information on employment outlook.

INDUSTRIAL TRAFFIC MANAGERS

(D.O.T. 184.168)

Nature of the Work

Industrial firms want to receive raw materials and deliver customers' goods promptly, safely, and with minimum cost. Arranging the transportation of materials and finished products is the job of an industrial traffic manager. Industrial traffic managers analyze various transportation possibilities and choose the most efficient type for their companies' needs—rail, air, road, water, pipeline, or some combination. Then they select the route and the particular carrier. To make their decisions, managers consider factors such as freight classifications and regulations, time schedules, size of shipments, and loss and damage rates. (This statement does not cover traffic managers who sell transportation services for railroads, airlines, trucking firms, and other freight carriers.)

Activities of industrial traffic managers range from checking freight bills to deciding whether the company should buy its own fleet of trucks or contract for services. They route and trace shipments, arrange with carriers for transportation services, prepare bills of lading and other shipping documents, and handle claims for lost or damaged goods. Traffic managers keep records of shipments, freight rates, commodity classifications, and applicable government regulations. They also must stay informed about changing transportation technology, such as containerization (the use of containers packed with many individual items). Some traffic managers (called physical distribution managers) are responsible for packaging shipments and maintaining warehouse facilities and transportation equipment.

Traffic managers often consult with other company officials about the firm's transportation needs. They may, for example, work with production department personnel to plan shipping schedules, or with members of the purchasing department to determine what quantities of goods can be transported most economically.

Since many aspects of transportation are subject to Federal, State, and local government regulations, traffic managers must know about these and any other legal matters that apply to their companies' shipping operations. High level traffic managers represent their companies before ratemaking and regulatory bodies such as the Interstate Commerce Commission, State

commissions, and local traffic bureaus.

Places of Employment

More than 20,000 persons were industrial traffic managers in 1974. Although most jobs are found in manufacturing firms, some traffic managers work for large stores. A few are self-employed consultants, or work for firms that handle transportation problems for clients.

Training, Other Qualifications, and Advancement

Although high school graduates with experience in traffic departments sometimes are hired as traffic managers, a college education is increasingly important in this field. For some kinds of work, college training is required. To argue cases before the Interstate Commerce Commission, for example, a traffic manager must meet standards that include at least 2 years of college. Although some employers prefer graduates who have a degree in traffic management, others seek liberal arts majors who have had courses in transportation, management, economics, statistics, marketing, or commercial law.

Industrial traffic training is available through colleges and universities, traffic management schools, and seminars sponsored by private organizations. More than 100 colleges, universities, and junior colleges offer a degree in traffic management.

Industrial traffic managers should be able to analyze numerical and technical data such as freight rates and classifications to solve transportation problems. The job also requires the ability to work independently and to present facts and figures in a convincing manner.

Newly hired traffic specialists often complete shipping forms and calculate freight charges. After gaining experience, they do more technical work such as analyzing transportation statistics. A competent worker may advance to a supervisory job such as supervisor of rates and routes; a few are promoted to assistant general traffic manager and eventually to general traffic manager. Industrial traffic managers can sometimes help their chances for advancement by participating in company-sponsored training programs or taking advanced courses in traffic management.

Employment Outlook

Industrial traffic management is a relatively small occupation and is expected to grow more slowly than the average for all occupations through the mid-1980's. A few openings will become available each year as new jobs are created, and as traffic managers die, retire, or leave the field for other reasons. College graduates with a major in traffic management or transportation can expect first consideration for the available jobs.

Growth in the occupation will stem from an increasing emphasis on reducing the cost of receiving raw materials and distributing finished products. As the distance between markets becomes greater and rate schedules and regulations governing transportation more complex, manufacturers increasingly will require traffic specialists with the expertise to obtain the lowest possible freight rates.

Earnings and Working Conditions

Industrial traffic managers' salaries started at about $15,000 a year in 1974, according to the limited information available. Although earnings of experienced traffic managers vary, in general they are much higher than the average for

all nonsupervisory workers in private industry, except farming. Some traffic executives earned $40,000 a year or more.

Although industrial traffic managers usually have a standard workweek, some of them have to spend time outside regular working hours preparing reports, attending meetings, and traveling to hearings before State and Federal regulatory agencies.

Sources of Additional Information

Information on education and technical training is available from:

American Society of Traffic and Transportation, Inc., 547 West Jackson Blvd., Chicago, Ill. 60606.

LAWYERS

(D.O.T. 110.108, .118, and 119.168)

Nature of the Work

At some time in our life, each of us may need a lawyer for advice about our rights and responsibilities when we buy property, make a will, or settle an estate. In addition, lawyers, also called attorneys, negotiate the settlement of legal problems out of court or, when necessary, represent clients in court or before government agencies.

Most lawyers are engaged in general practice and handle all kinds of legal work for clients. However, a significant number specialize in one branch of law, such as corporation, criminal, labor, patent, real estate, tax, or international law. Some attorneys devote themselves entirely to trying cases in the courts. Others never appear in court but instead draw up wills, trusts, contracts, mortgages, and other legal documents; conduct out-of-court negotiations; and do investigative and other legal work to prepare for trials. Some may act as trustees by managing a person's property and funds, or as executors by seeing that the provisions of their client's will are carried out. Still others teach, do research or write, or perform administrative work. Government attorneys help develop Federal and State laws and programs; they prepare drafts of proposed legislation, establish law enforcement procedures, and argue cases.

Many people who have legal training do not work as lawyers but use their knowledge of law in other occupations. They may, for example, be insurance adjusters, tax collectors, probation officers, credit investigators, or claim examiners. A legal background also is an asset to those seeking or holding public office.

Places of Employment

Over 340,000 persons worked as lawyers in 1974. Although the majority were men, increasing numbers of women are choosing careers in law. In 1974, for example, about 1 of every 5 students in American Bar Association (ABA) approved law schools was a woman.

Most lawyers are in private practice, either self-employed (alone or in partnerships) or working for other lawyers or law firms. In addition, about 22,000 lawyers worked for the Federal Government, chiefly in the Justice, Defense, and Treasury Departments, and the Veterans Administration; another 32,000 were employed by State and local governments. Others worked for private companies or taught in law schools. Some salaried lawyers also have independent practices; others do legal work part time while in another occupation.

Training, Other Qualifications, and Advancement

In order to practice law in the courts of any State, a person must be admitted to its bar. Applicants for admission to the bar must pass a written examination; however, a few States drop this requirement for graduates of their own law schools. Lawyers who have been admitted to the bar in one State usually can be admitted in another without taking an examination provided they meet that State's standards of good moral character and have a specified period of legal experience. Each Federal court or agency sets its own qualifications for those practicing before it.

To qualify for the bar examination in most States, an applicant must have completed 3 years of college and have graduated from a law school approved by the American Bar Association or the proper State authorities. A few States accept the study of law wholly in a law office or in combination with study in a law school; only California accepts the study of law by correspondence as qualification for taking the bar exam. Several States require registration and approval of students by the State Board of Examiners, either before they enter law school, or during the early years of legal study. In a few States, candidates must complete clerkships before they are admitted to the bar.

The required college and law school work usually takes 7 years of full-time study after high school—4 years of college followed by 3 years in law school. Although a number of law schools accept students after 3 years of college, an increasing number require applicants to have a bachelor's degree. To meet the needs of students who can attend only part time, a number of law schools have night or part-time divisions which usually require 4 years of study. In 1974, about one-fifth of all law students in ABA-approved schools were enrolled in evening classes.

Law schools seldom specify college subjects that must be included in students' prelegal education. However, English, history, economics and other social sciences, logic, and public speaking are important for prospective lawyers. Students interested in a particular aspect of the law may find it helpful to take related courses—for example, engineering and science courses for the prospective patent attorney, and accounting for the future tax lawyer. Acceptance by most law schools depends on the applicant's ability to demonstrate an aptitude for the study of law, usually through the "Law School Admissions Test." In 1974, 156 law schools were approved by the American Bar Association. Others—chiefly night schools—were approved by State authorities only.

The first year or year and a half of law school generally are devoted to fundamental courses such as constitutional law, contracts, property law, and judicial procedure. In the third year, students may elect specialized courses in fields such as tax, labor, or corporation law. Practical experience is often acquired by participation in school-sponsored legal aid activities, in the school's practice court where students conduct trials under the supervision of experienced lawyers, and through writing on legal issues for the school's law journal. Graduates receive the degree of *juris doctor* (J.D.) from most schools as the first professional degree. Advanced study is often desirable for those planning to specialize, do research, or teach in law schools.

The practice of law involves a great deal of responsibility. Persons planning careers in law should like to work with people and ideas, and be able to win the confidence of their clients.

Most beginning lawyers start in salaried positions, although some go into independent practice immediately after passing the bar examination. Newly hired salaried attorneys usually act as research assistants (law clerks) to experienced lawyers or judges. After several years of progressively responsible salaried employment, many lawyers go into practice for themselves. Some lawyers, after years of practice, become judges.

Employment Outlook

A rapid increase in the number of law school graduates has created keen competition for the available jobs. In the years ahead, the number of graduates is expected to increase further and intensify this competition.

Employers will be very selective in hiring new lawyers. Graduates of well-known law schools and those who rank high in their classes should find salaried positions with law firms, on the legal staffs of corporations and government agencies, and as law clerks for judges. Graduates of less prominent schools and those with lower scholastic ratings will experience some difficulty in finding salaried jobs. However, many will find opportunities in fields where legal training is an asset but not normally a requirement.

The employment of lawyers is expected to grow faster than the average for other occupations through the mid-1980's as increased business activity and population create a demand for attorneys to deal with a growing number of legal questions. Supreme Court decisions extending the right to counsel for persons accused of lesser crimes, the growth of legal action in the areas of consumer protection, the environment, and safety, and an expected increase in the use of legal services by middle income groups through prepaid legal service programs also should provide employment opportunities. Other jobs will be created by the need to replace lawyers who retire

or leave the occupation for other reasons.

Prospects for establishing a new practice probably will continue to be best in small towns and expanding suburban areas. In such communities competition is likely to be less than in big cities and new lawyers may find it easier to become known to potential clients; also, rent and other business costs are somewhat lower. Salaried positions, on the other hand, will be limited largely to urban areas where the chief employers of legal talent—government agencies, law firms, and big corporations—are concentrated.

Earnings and Working Conditions

Lawyers entering practice in 1974 earned starting salaries ranging from about $10,000 to $12,000 a year. Factors affecting the salaries offered to new graduates include: Their academic records; types, sizes, and locations of their employers; and whether the new lawyer has any specialized educational background that the employer requires. Lawyers with at least a year's experience working in manufacturing and business firms earned about $16,000 a year; those with a few years of experience earned over $20,000 annually. In the Federal Government, annual starting salaries for attorneys were $12,841 or $15,481 in late 1974, depending upon their academic and personal qualifications. Those with a few years of experience earned $21,816 a year. On the average, lawyers earn over three times as much as nonsupervisory workers in private industry, except farming.

Beginning lawyers engaged in legal aid work usually receive the lowest starting salaries. New lawyers starting their own practices may earn little more than expenses during the first few years and may need to work part time in other occupations.

Lawyers on salary receive increases as they assume greater responsibility. In 1974, those in charge of legal staffs in private industry averaged more than $37,200 a year. Incomes of lawyers in private practice usually grow as their practices develop. Private practitioners who are partners in law firms generally earn more than those who practice alone.

Lawyers often work long hours and are under considerable pressure when a case is being tried. In addition, they must keep abreast of the latest laws and court decisions. However, since lawyers in private practice can determine their own hours and workload, many stay in practice well past the usual retirement age.

Sources of Additional Information

The specific requirements for admission to the bar in a particular State may be obtained at the State capital from the clerk of the Supreme Court or the secretary of the Board of Bar Examiners.

Information on law as a career is available from:

Information Service, The American Bar Association, 1155 East 60th St., Chicago, Ill. 60637.

Information on financial aid and law school accreditation is available from:

Association of American Law Schools, Suite 370, 1 Dupont Circle NW., Washington, D.C. 20036.

MARKETING RESEARCH WORKERS

(D.O.T. 050.088)

Nature of the Work

Businesses require a great deal of information to make sound decisions on how to market their products. Marketing research workers provide much of this information by analyzing data on products and sales, making surveys, and conducting interviews. They prepare sales forecasts and make recommendations on product design and advertising.

Most marketing research starts with the collection of facts from sources such as company records, published materials, and experts on the subject under investigation. For example, marketing research workers making sales forecasts may begin by studying the growth of sales volume in several different cities. This growth may then be traced to increases in population, size of the company's sales force, or amount of money spent on advertising. Other marketing research workers may study changes in the quantity of company goods on store shelves or make door-to-door surveys to obtain information on company products.

Marketing research workers are often concerned with customers' opinions and tastes. For example, to help decide on the design and price of a new line of television sets, marketing research workers may survey consumers to find out what styles and price ranges are most popular. This type of survey usually is supervised by marketing researchers who specialize in consumer goods; that is, merchandise sold to the general public. They may be helped by statisticians who select a group (or sample) to be interviewed and "motivational research" specialists who phrase questions to produce reliable information. Once the investigation is underway, the marketing research worker may supervise the interviewers as well as direct the office workers who tabulate and analyze the information collected.

Marketing surveys on products used by business and industrial firms may be conducted somewhat differently from consumer goods surveys. Marketing researchers often conduct the interviews themselves to gather opinions of the product. They also may speak to company officials about new uses for it. They must therefore have

specialized knowledge of both marketing techniques and the industrial uses of the product.

Places of Employment

About 25,000 full-time marketing research workers were employed in 1974. Most jobs for marketing research workers are found in manufacturing companies, advertising agencies, and independent research organizations. Large numbers are employed by stores, radio and television firms, and newspapers; others work for university research centers and government agencies. Marketing research organizations range in size from one-person enterprises to firms with a hundred employees or more.

New York City has the largest number of marketing research workers. Many major advertising agencies, independent marketing organizations, and central offices of large manufacturers are located there. The second largest concentration is in Chicago. However, marketing research workers are employed in many other cities as well—wherever there are central offices of large manufacturing and sales organizations.

Training, Other Qualifications, and Advancement

Although a bachelor's degree is required for marketing research trainees, graduate training is necessary for many specialized positions and for advancement to higher level positions. Many graduates qualify for jobs through previous experience in other types of research, while employers may hire university teachers of marketing or statistics to head new marketing research departments.

College courses considered to be valuable preparation for work in marketing research are statistics, English composition, speech, psychology, and economics. Some marketing research positions require skill in specialized areas, such as engineering, or substantial sales experience and a thorough knowledge of the company's products. Knowledge of data processing is helpful because of the growing use of computers in sales forecasting, distribution, and cost analysis.

Trainees usually start as research assistants or junior analysts. At first, they may do considerable clerical work, such as copying data from published sources, editing and coding questionnaires, and tabulating survey returns. They also learn to conduct interviews and write reports on survey findings. As they gain experience, assistants and junior analysts may assume responsibility for specific marketing research projects, or advance to supervisory positions. An exceptionally able worker may become marketing research director or vice president for marketing and sales.

Either alone or as part of a team, marketing research workers must be resourceful as they analyze problems and apply various techniques to their solution. As advisers to management, they should be able to write clear reports informing company officials of their findings.

Employment Outlook

Opportunities should be best for applicants with graduate training in marketing research or statistics. The growing complexity of marketing research techniques also will expand opportunities in this field for psychologists, economists, and other social scientists.

Marketing research employment rises as new products and services are developed requiring information to identify potential buyers. The demand for new products and services will grow most quickly

when business activity and personal incomes are rapidly expanding. In periods of slow economic growth, however, the demand for marketing services may be reduced and limit the hiring of research workers.

Over the long run, our growing population and the increased variety of goods and services that businesses and individuals will require is expected to stimulate a high level of marketing activity. As a result, employment of marketing research workers is expected to grow much faster than the average for other occupations through the mid-1980's.

The competition among manufacturers of both consumer and industrial products will make it increasingly important to appraise marketing situations. As techniques improve and more statistical data accumulate, company officials are likely to turn more often to marketing research workers for information and advice.

Earnings and Working Conditions

Starting salaries for marketing research trainees were about $10,000 a year in 1974, according to the limited information available. Persons with master's degrees in business administration and related fields usually started with somewhat higher salaries.

Experienced workers such as senior analysts received salaries over $16,000 a year. Earnings were highest, however, for workers in management positions of great responsibility. Vice presidents of marketing research earned well over $25,000 a year in 1974.

Marketing research workers usually work in modern, centrally located offices. Some, especially those employed by independent research firms, do a considerable amount of traveling in connection with their work. Also, they may frequently work under pressure and for long hours to meet deadlines.

Sources of Additional Information

Additional information on careers in marketing research is available from:

American Marketing Association, 222 South Riverside Plaza, Chicago, Ill. 60606.

PERSONNEL AND LABOR RELATIONS WORKERS

(D.O.T. 166.088 through .268; 169.118)

Nature of the Work

Attracting the best employees available and matching them to the jobs they can do best is important for the success of any organization. Today, most businesses are much too large for close contact between owners and their employees. Instead, personnel and labor relations workers provide the link between management and employees—assisting management to make effective use of employees' skills, and helping employees to find satisfaction in their jobs and working conditions. Although some jobs require only limited contact with people outside the office, most jobs in this field involve frequent contact with other people. Dealing with people is an essential part of the job.

Personnel workers and labor relations workers concentrate on different aspects of employer-employee relations. Personnel workers interview, select, and recommend applicants to fill job openings. They handle wage and salary administration, training and career development, and employee benefits. "Labor relations" usually means union-management relations, and people who specialize in this field work for the most part in unionized establishments. They help company officials prepare for collective bargaining sessions, participate in contract negotiations with the union, and handle labor relations matters that come up everyday.

In a small company, personnel work consists mostly of interviewing and hiring, and one person usually can handle it all. By contrast, a large organization needs an entire staff, which might include recruiters, interviewers, counselors, job analysts, wage and salary analysts, education and training specialists, and labor relations specialists, as well as technical and clerical workers.

Personnel work often begins with the *personnel recruiter* or *employment interviewer* (D.O.T. 166.268), who works on a person-to-person basis with present and prospective employees. Recruiters travel around the country, often to college campuses, in the search for promising job applicants. Interviewers talk to applicants, and select and recommend those who appear qualified to fill vacancies. They often administer tests to applicants and interpret the results. Hiring and placement specialists need to be thoroughly familiar with the organization and its personnel policies, for they must be prepared to discuss wages, working conditions, and promotional opportunities with prospective and newly hired employees. They also need to keep informed about equal employment opportunity and affirmative action guidelines. Equal employment opportunity is a complex and sensitive area of personnel work which in some large organizations is handled by special EEO counselors or coordinators. The work of Employment Counselors, which is similar in a number of ways, is described in a separate statement elsewhere in the *Handbook*.

Job analysts (D.O.T. 166.068) and *salary and wage administrators* (D.O.T. 169.118) do very exacting work. Job analysts collect and analyze detailed information on jobs, job qualifications, and worker characteristics in order to prepare

job descriptions, sometimes called position classifications. Job descriptions tell applicants, interviewers, supervisors, and others basically what the duties of a job are and what training and skills it requires. Whenever a government agency or large business firm introduces a new job or evaluates existing ones, it calls upon the expert knowledge of the job analyst. Accurate information about job duties also is required when a firm evaluates its pay system and considers changes in wages and salaries. Establishing and maintaining pay systems is the principal job of wage administrators. They devise ways of making sure that pay rates within the firm are fair and equitable, and conduct surveys to see how their pay rates compare with those elsewhere. Being sure that the firm's pay system complies with laws and regulations is another part of the job, one which requires knowledge of compensation structures and labor law.

Training specialists supervise or conduct training sessions, prepare manuals and other materials for these courses, and look into new methods of training. They also counsel employees on training opportunities, which may include on-the-job, apprentice, supervisory, or management training.

Employee-benefits supervisors and other personnel specialists handle the employer's benefits program, which often includes health insurance, life insurance, disability, and pension plans. These workers also coordinate a wide range of employee services, including cafeterias and snack bars, health rooms, recreational facilities, newsletters and communications, and counseling for work-related personal problems. Counseling employees who are approaching retirement age is a particularly important job of these workers.

Occupational safety and health programs are handled in various ways. Quite often, in small companies especially, accident prevention and industrial safety are the responsibility of the personnel department—or of the labor relations specialist, if the union has a safety representative. Increasingly, however, there is a separate safety department under the direction of a safety and health professional, generally a safety engineer or industrial hygienist. (The work of Occupational Safety and Health Workers is discussed elsewhere in the *Handbook*.)

Labor relations specialists (D.O.T. 169.118) advise management on all aspects of union-management relations. When the contract is up for negotiation, they provide background information and technical support, a job that requires extensive knowledge of economics, labor law, and collective bargaining trends. Actual negotiation of the agreement is conducted at the top level, with the director of labor relations or other top-ranking official serving as the employer's representative, but members of the company's labor relations staff play an important role throughout the negotiations.

Much of the everyday work of the labor relations staff concerns interpretation and administration of the contract, the grievance procedures in particular. Members of the labor relations staff would work with the union on seniority rights under the layoff procedure set forth in the contract, for example. Later in the day, they might meet with the union steward about a worker's grievance. Doing the job well means staying abreast of current developments in labor law, in-

Job analyst reviews new job descriptions with a company official.

cluding arbitration decisions, and maintaining continuing liaison with union officials.

Personnel workers in government agencies generally do the same kind of work as those in large business firms. There are some differences, however. Public personnel workers deal with employees whose jobs are governed by civil service regulations. Civil service jobs are strictly classified as to duties, training, and pay. This requires a great deal of emphasis on job analysis and wage and salary classification; many people in public personnel work spend their time classifying and evaluating jobs, or devising, administering, and scoring competitive examinations given to job applicants.

Knowledge of rules and regulations pertaining to affirmative action and equal opportunity programs is important in public personnel work. In 1972, the U.S. Civil Service Commission established a specialization for Federal personnel workers concerned with promoting equal opportunity in hiring, training, and advancement. Similar attention to equal employment opportunity, accompanied by a need for qualified staff, is evident in State and local government agencies.

Labor relations is an increasingly important specialty in public personnel administration. Labor relations in this field have changed considerably in recent years, as union strength among government workers has grown. This has created a need for more and better trained workers to handle negotiations, grievances, and arbitration cases on behalf of Federal, State, and local government agencies.

Places of Employment

In 1974, over 320,000 people were personnel and labor relations workers. Three out of four worked in private industry, for manufacturers, banks, insurance companies, airlines, railroads, department stores, and other business concerns. Some worked for private employment agencies, including executive job-search agencies, "office temporaries" agencies, and others.

A large number of personnel and labor relations workers, over 80,000 in 1974, worked for Federal, State, and local government agencies. Most of these were in personnel administration, and handled recruitment, interviewing, testing, job classification, training, and other personnel matters for the Nation's 14.5 million public employees. Some were on the staff of the U.S. Employment Service and State employment agencies. Still others worked for agencies which oversee compliance with labor laws. Some, for example, were wage-hour compliance officers; their work is described in another part of the *Handbook*, in the statement on Health and Regulatory Inspectors (Government). Other public employees in this field carried out research in economics, labor law, personnel practices, and related subjects, and sought new ways of ensuring that workers' rights under the law are understood and protected.

In comparison with private industry, labor unions do not employ a large number of professionally trained labor relations workers. An elected union official generally handles labor relations matters at the company level. At national and international union headquarters, however, the research and education staff usually includes specialists with degrees in industrial and labor relations, economics, or law.

A few personnel and labor relations workers are in business for themselves as management consultants or labor-management relations experts. In addition, some people in the field teach college or university courses in personnel administration, industrial relations, and related subjects.

Most jobs for personnel and labor relations workers are located in the highly industrialized sections of the country.

Training, Other Qualifications, and Advancement

Many employers seek to fill beginning positions in personnel and labor relations with college graduates who have the potential to move into management jobs. Some employers look for graduates who have majored in personnel administration or industrial and labor relations, while others prefer college graduates with a general business background. Still other employers feel that a well-rounded liberal arts education is the best preparation for personnel work. A college major in personnel administration, political science, or public administration can be an asset in looking for a job with a government agency.

At least 200 colleges and universities have programs leading to a degree in the field of personnel and labor relations. (While personnel administration is widely taught, the number of programs which focus primarily on labor relations is quite small.) In addition, many schools offer course work in closely related fields. An interdisciplinary background is appropriate for work in this area, and a combination of courses in the social sciences, behavioral sciences, business, and economics is useful.

Prospective personnel workers might include courses in personnel management, business administration, public administration, psychology, sociology, political science, economics, and statistics. Courses in labor law, collective bargaining, labor economics, labor history, and industrial psychology provide valuable backgound for the prospective labor relations worker.

Graduate study in industrial relations, economics, business, or law provides sound preparation for work in labor relations. While the law degree seldom is required for jobs at the entry level, most of the

people with responsibility for contract negotiations are lawyers, and the industrial relations plus law degree combination is becoming highly desirable.

A college education is important, but it is not the only way to enter personnel work. Some people enter the field at the clerical level, and advance to professional positions on the basis of experience. They often find it helpful to take college courses part time, however.

New personnel workers usually enter formal or on-the-job training programs to learn how to classify jobs, interview applicants, or administer employee benefits. After the training period, new workers are assigned to specific areas in the company's employee relations department. After gaining experience, they usually can advance within their own company or transfer to another employer. At this point, some people move from personnel to labor relations work.

Some people enter the labor relations field directly, as trainees. They are usually graduates of master's degree programs in industrial relations, or may have a law degree. Quite a few people, however, begin in personnel work, gain experience in that area, and subsequently move into a labor relations job.

Workers in the middle ranks of a large organization often transfer to a top job in a smaller one. Employees with exceptional ability may be promoted to executive positions, such as director of personnel or director of labor relations.

Personnel and labor relations workers should speak and write effectively and be able to work with people of all levels of education and experience. They also must be able to see both the employee's and the employer's points of view. In addition, they should be able to work as part of a team. They need supervisory abilities and must be able to accept responsibility. Integrity and fairmindedness are important qualities for people in personnel and labor relations work. A persuasive, congenial personality can be a great asset.

Employment Outlook

The number of personnel and labor relations workers is expected to grow faster than the average for all occupations through 1985, as employers, increasingly aware of the benefits to be derived from good labor-management relations, continue to support sound, capably staffed employee relations programs. In addition to new jobs created by growth of the occupation, many openings will become available each year because of the need to replace workers who die, retire, or leave their jobs for other reasons.

Recent legislation setting standards for employment practices in the areas of occupational safety and health, equal employment opportunity, and pensions has stimulated demand for personnel and labor relations workers. Continued growth is foreseen, as employers throughout the country review existing programs in each of these areas and, in many cases, establish entirely new ones. This has created job opportunities for people with appropriate expertise. The effort to end discriminatory employment practices, for example, has led to scrutiny of the testing, selection, placement, and promotion procedures in many companies and government agencies. The findings are causing a number of employers to modify these procedures, and to take steps to raise the level of professionalism in their personnel departments.

Substantial employment growth is foreseen in the area of public personnel administration. Opportunities probably will be best in State and local government, areas which are expected to experience strong employment growth over the next decade. By contrast, Federal employment will grow slowly. Moreover, as union strength among public employees continues to grow, State and local agencies will need many more workers qualified to deal with labor relations. Enactment of collective bargaining legislation for State and local government employees could greatly stimulate demand for labor relations workers knowlegeable about public sector negotiations.

Although the number of jobs in both personnel and labor relations is projected to increase over the next decade, competition for these jobs also is increasing. Particularly keen competition is anticipated for jobs in labor relations. A small field, labor relations traditionally has been difficult to break into, and opportunities are best for applicants with a master's degree or a strong undergraduate major in industrial relations, economics, or business. A law degree is an asset.

Earnings and Working Conditions

Beginning job analysts in private industry started at $9,800 a year in 1974, according to a Bureau of Labor Statistics survey. Experienced job analysts earned $17,300 a year, about twice the average for all nonsupervisory workers in private industry, except farming. Directors of personnel earned between $15,600 and $27,300 a year; top labor relations executives in large corporations earned considerably more.

Beginning job analysts employed by State governments had starting salaries ranging from $8,000 to $10,000 in 1974, according to a survey of public service pay conducted by the International Personnel Management Association. In the Federal Government, new graduates with a bachelor's degree generally started at $8,500 a year in late 1974. Those with a master's degree started at about $10,500 a year, or in some cases, at $12,800 a year.

Average salaries of Federal em-

ployees in several different areas of personnel work ranged from about $19,000 to $22,500 in late 1974, as follows:

Staffing specialists	$19,100
Position classifiers	20,300
Personnel management specialists	21,500
Employee development specialists	21,500
Salary and wage administrators	22,500

Federal employees in the field of labor relations had generally comparable salaries. Labor-management and employee relations specialists and labor-management relations officers averaged $21,500 a year in late 1974. Federal mediators' salaries were higher: about $30,000 a year, on the average.

Employees in personnel offices generally work 35 to 40 hours a week. As a rule, they are paid for holidays and vacations, and share in retirement plans, life and health insurance plans, and other benefits available to all professional workers in their organizations.

Sources of Additional Information

For general information on careers in personnel and labor relations work, write to:

American Society for Personnel Administration, 19 Church St., Berea, Ohio 44017.

Information about careers in public personnel administration is available from:

International Personnel Management Association, 1313 E. 60th St., Chicago, Ill. 60637.

A brochure describing a career in labor-management relations as a field examiner is available from:

Director of Personnel, National Labor Relations Board, 1717 Pennsylvania Ave. NW., Washington, D.C., 20570.

PUBLIC RELATIONS WORKERS

(D.O.T. 165.068)

Nature of the Work

How successfully an organization presents itself may affect its public acceptance and influence. Public relations workers help organizations build and maintain positive public images. Public relations is more than telling the employer's "story," however. Understanding the attitudes and concerns of customers, employees, and various other "publics"—and communicating this information to management—is an important part of the job.

Public relations departments are found in many different organizations, and workers must tailor their programs to an employer's particular needs. A public relations director for a college or university, for example, may devote most of his or her energies to attracting additional students, while one in a large corporation may handle the employer's relations with stockholders, government agencies, and community groups.

Public relations workers put together information that keeps the public aware of their employer's activities and accomplishments. After preparing the information, they contact people in the media who might be interested in publicizing their material. Many television commercials or special reports, newspaper items, and magazine articles start at public relations workers' desks. Sometimes the subject

Public relations worker reviews copy for new stockholders report with company officials.

is a company and its policies towards its employees or its role in the community. Often the subject is a public issue, such as health, nutrition, energy, or the environment.

Public relations workers also arrange and conduct programs in which company representatives will have direct contact with the public. Such work includes setting up speaking engagements for company officials and writing speeches for them. These workers often serve as an employer's representative during community projects and occasionally show films at school assemblies, plan conventions, or manage fund-raising campaigns.

Public relations staffs in very large firms may number 200 or more, but in most firms the staff is much smaller. The director of public relations may develop overall plans and policies with a top management executive having the authority to make final decisions. In addition, large public relations departments employ writers, research workers, and other specialists who prepare material for the different media or write reports sent to stockholders.

Workers who handle publicity for an individual or direct public relations for a university or small business may handle all aspects of the job. They make contacts with people outside the organization, do the necessary planning and research, and prepare material for publication. These workers may combine public relations duties with advertising or sales promotion work; some are top-level officials and others have lower level positions. The most skilled public relations work of making overall plans and maintaining contacts usually is done by the department director and highly experienced staff members.

Places of Employment

More than 100,000 persons—about 30 percent of them women—were public relations workers in 1974. Manufacturing firms, public utilities and transportation companies, insurance companies, and trade and professional associations employ the majority of public relations workers. However, a sizeable number work for government agencies, or for schools, colleges, museums, and many other kinds of educational, religious, and welfare organizations. The rapidly expanding health field also offers opportunities for public relations work, in hospitals, pharmaceutical companies, and medical associations, for example. A number of public relations workers are employed by consulting firms, which furnish public relations services to clients for a fee.

Public relations workers are concentrated in large cities where press services and other communications facilities are readily available, and where many businesses and trade associations have their headquarters. More than half of the estimated 1,700 public relations consulting firms in the United States are in New York, Los Angeles, Chicago, and Washington, D.C.

Training, Other Qualifications, and Advancement

A college education combined with journalism experience is an excellent preparation for public relations work. Although most beginners have a college degree in journalism, English, or public relations, some employers prefer a background in a field related to the firm's business—science or engineering, for example. Some firms want college graduates with at least 1 year's experience working for the news media.

In 1974, over 80 colleges and more than 30 graduate schools offered degree programs or special curriculums in public relations. In addition, nearly 200 colleges offered at least one course in this field.

Courses in journalism, business administration, psychology, and public speaking help in preparing for a public relations career. Extracurricular activities such as writing for a school publication provide valuable experience. Part-time or summer jobs in public relations provide training that can help in competing for entry positions.

Creativity, initiative, and the ability to express thoughts clearly and simply are important to the public relations worker. Fresh ideas are so vital in public relations that some experts spend all their time developing new ideas, leaving the job of carrying out programs to others.

People who choose public relations work as a career need an outgoing personality, self-confidence, and an understanding of human psychology. They should have the enthusiasm necessary to motivate people. Public relations workers need a highly developed sense of competitiveness and the ability to function as part of a team.

Some companies—particularly those with large public relations staffs—have formal training programs for new workers. In other firms, new employees learn by working under the guidance of experienced staff members. Beginners often maintain files of material about company activities, scan newspapers and magazines for appropriate articles to clip, and assemble information for speeches and pamphlets. After gaining experience, they work on more difficult assignments, such as writing press releases, speeches, and articles for publication.

Promotion to supervisory jobs may come as workers show they can handle more demanding and creative assignments. Some experienced public relations workers start their own consulting firms.

Employment Outlook

Employment of public relations workers is expected to increase

about as fast as the average for all occupations through the mid-1980's. In addition to new jobs created by this growth, openings will occur every year because of the need to replace workers who leave the field.

Demand for public relations workers may be affected by economic conditions, slackening as employers delay expansion or impose staff cuts during business slowdowns. Over the long run, however, public relations spending is expected to increase substantially. Corporations, associations, and other large organizations are likely to expand their public relations efforts to gain public support and approval.

Competition for beginning jobs is keen, for public relations work has an aura of glamour and excitement which attracts large numbers of jobseekers. Prospects for a career in public relations are best for enthusiastic people with sound academic preparation and some media experience.

Earnings and Working Conditions

Starting salaries for college graduates beginning in public relations work ranged from $7,500 to $9,000 a year in 1974, according to the limited data available.

The salaries of experienced workers generally are highest in large organizations with extensive public relations programs. Directors of public relations for medium-sized firms earned $15,000 to $30,000 a year; those at large companies had salaries in the $20,000 to $50,000 range. Salaries for some officials, such as vice-presidents in charge of public relations, can range from $25,000 to $75,000 a year or more.

The median salary for directors of public relations was about $23,000 in 1974. Public relations consulting firms often pay higher salaries than organizations with their own public relations departments. In social welfare agencies, nonprofit organizations, hospitals, and universities, salaries generally are lower.

Although the workweek for public relations staffs usually is 35 to 40 hours, overtime may be necessary to prepare or deliver speeches, attend meetings and community activities, or travel out of town. Occasionally, the nature of their regular assignments or special events requires public relations workers to be on call around the clock.

Sources of Additional Information

For career information and a list of schools offering degrees and courses in the field, write:

Career Information, Public Relations Society of America, Inc., 845 Third Ave., New York, N.Y. 10022.

Salary data and other statistics are available from:

PR Reporter, Meriden, N.H. 03770.

PURCHASING AGENTS

(D.O.T. 162.158, 180.118, 191.118, and 252.358)

Nature of the Work

If materials, supplies, or equipment are not on hand when needed, an organization's work may be interrupted or halted. Maintaining an adequate supply of items a firm needs to operate is the purchasing agent's job.

Purchasing agents, also called industrial buyers, and their assistants obtain goods and services of the required quality at the lowest possible cost, and see that adequate supplies are kept on hand. Agents who work for manufacturing firms buy machinery, raw materials, and product components; those working for government agencies may purchase office supplies, furniture, and business machines. Informmation on retail buyers, who purchase merchandise for resale in its original form, is presented in the statement on Buyers elsewhere in the *Handbook*.

Purchasing agents buy when stocks on hand reach a predetermined reorder point, or when a department in the organization requisitions items it needs. Because agents often can purchase from many sources, their main job is selecting the seller who offers the best value.

Purchasing agents use a variety of means to select among suppliers. They compare listings in catalogs and trade journals and telephone suppliers to get information. They also meet with salespersons to examine samples, watch demonstrations of equipment, and discuss items to be purchased. Sometimes agents invite suppliers to bid on large orders; then they select the lowest bidder among those who meet requirements for quality of goods and delivery date.

In some cases, however, purchasing agents must deal directly with a manufacturer to obtain specially designed items made exclusively for their company. These agents must have a high degree of technical expertise to insure that all product specifications are met.

It is important that purchasing agents develop good business relations with their suppliers. This can result in savings on purchases, favorable terms of payment, and quick delivery on rush orders or materials in short supply. They also work closely with personnel in various departments of their own organization. For example, they may discuss product design with company engineers or shipment problems with workers in the shipping and receiving or traffic departments.

Once an order has been placed with a supplier, the purchasing agent makes periodic checks to insure that it will be delivered on time. This is necessary to prevent work flow interruptions due to lack

Purchasing agent discusses an order with a sales representative.

of materials. After an order has been received and inspected, the purchasing agent authorizes payment to the shipper.

Because of its importance, purchasing usually is designated as a separate responsibility within a firm. In a large firm, the purchasing manager directs the work of a staff which includes purchasing agents, purchasing assistants, and clerical workers. In such a firm, purchasing agents usually are responsible for buying one or more specific items—for example, steel, lumber, cotton, or petroleum products. In smaller firms, agents generally are assigned certain categories of goods, such as all raw materials or all office supplies, furniture, and business machines.

Places of Employment

Nearly 190,000 persons—18 percent of them women—worked as purchasing agents in 1974. Over half worked in manufacturing industries. Large numbers also were employed by government agencies, construction companies, hospitals, and schools. Since the early 1960's, employment of women purchasing agents has increased much faster than that of men. Particularly impressive employment gains have been made by women with college degrees, and every indication points toward continuing job opportunities for women.

About half of all purchasing agents work in organizations that have fewer than five employees in the purchasing department. Many business firms and government agencies, however, have much larger purchasing departments; some employ as many as 100 specialized buyers or more.

Training, Other Qualifications, and Advancement

Most large employers seek college graduates for entry positions as assistant purchasing agents. A growing number of large companies look for applicants who have done graduate work in purchasing management or related fields. Although companies that manufacture complex machinery or chemicals may prefer a background in engineering or science, other companies hire business administration or liberal arts majors for trainee jobs. Courses in accounting, economics, and purchasing are helpful. Familiarity with the computer and its uses also is desirable. Some small firms prefer experience with the company, and select purchasing workers from among their own personnel, whether or not they have a college education. For advancement to management positions, however, a college degree is becoming increasingly important.

Regardless of previous training, beginning purchasing assistants must spend considerable time learning about their company's operations and purchasing procedures. They may be assigned to the storekeeper's section to learn about purchasing forms, inventory records, and storage facilities. Next they may work with experienced buyers to learn about types of goods purchased, prices, and suppliers.

Following the initial training period, assistant purchasing agents are given responsibility for purchasing standard catalog items. As they gain experience and demonstrate good judgment in performing various purchasing tasks, they may be promoted to purchasing agent. Purchasing agents with proven ability can move into a job as manager of a purchasing depart-

ment; some advance to executive positions as corporate director of purchasing and material management.

The purchasing agent must be able to analyze numbers and technical data in order to make buying decisions and take responsibility for spending large amounts of company money. The job requires the ability to work independently and a good memory for details. In addition, a purchasing agent must be tactful in dealing with salespersons and able to motivate others.

Employment Outlook

Employment of purchasing agents is expected to increase much faster than the average for all occupations through the mid-1980's. Several thousand jobs will be open every year due to growth of the occupation and the need to replace those who die, retire, or transfer to other work.

Growth in demand for industrial machinery, including engines and turbines, electronic computer equipment, and communications equipment, will increase employment opportunities. For example, purchasing agents will be needed to develop reliable new sources of supply for materials which are in short supply. In addition, the growing specialization of manufacturing processes will spur demand for purchasing agents with a technical background and those who have completed graduate level courses in purchasing management.

Many opportunities also should occur in firms providing personal, business, and professional services. Strong growth is expected for this sector of the economy, and a growing number of employers are recognizing the importance of professional purchasers in relatively small firms.

Earnings and Working Conditions

College graduates hired as assistant purchasing agents in large firms earned about $8,500 a year in 1974, according to the limited data available.

Experienced agents purchasing standard items averaged about $10,000 a year; buyers purchasing complex or technical goods averaged between $12,100 and $14,700. Those responsible for the purchase of highly complex and specialized items earned about $17,400 in 1974. Managers of purchasing departments earned substantially more and many top purchasing executives earned over $50,000 a year. Salaries generally are lower in small companies. In 1974, earnings of purchasing agents were about one and one-half times as much as the average for all nonsupervisory workers in private industry, except farming.

In the Federal Government, beginning purchasing agents who had college degrees earned $8,500 or $10,500 in late 1974, depending on scholastic achievement and relevant work experience. The average salary for all purchasing agents in the Federal Service was $18,600. Salary levels vary widely among State governments; however, average earnings range from $9,000 to $11,700 for purchasers of standard items, $11,900 to $15,600 for senior buyers purchasing highly complex items, and $18,000 to $21,900 for State purchasing directors.

Sources of Additional Information

Further information about a career in purchasing is available from:

National Association of Purchasing Management, 11 Park Place, New York, N.Y. 10007.

National Institute of Governmental Purchasing, 1001 Connecticut Ave. NW., Washington, D.C. 20036.

URBAN PLANNERS

(D.O.T. 199.168)

Nature of the Work

Urban planners, often called community or regional planners, develop programs to provide for future growth and revitalization of urban, suburban and rural communities. They help local officials make decisions to solve social, economic and environmental problems.

Planners examine community facilities such as health clinics and schools to be sure these facilities can meet the demands placed upon them. They also keep abreast of the legal issues involved in community development or redevelopment and any changes in housing and building codes. Because suburban growth has increased the need for better ways of traveling to the urban center, the planner's job often includes designing new transportation and parking facilities.

Urban planners prepare for situations or needs that are likely to develop as a result of population growth or social and economic change. They estimate, for example, the community's long-range needs for housing, transportation, and business and industrial sites. Working within a framework set by the community government, they analyze and propose alternative ways to achieve more efficient and attractive urban areas.

Before preparing plans for long-range community development, urban planners prepare detailed studies that show the current use of land for residential, business, and community purposes. These reports present information such as the arrangement of streets, highways, and water and sewer lines, and the location of schools, libraries, and playgrounds. They also provide information on the types of industries in the community, characteristics of the population, and employment and economic trends. With this in-

formation, urban planners propose ways of using undeveloped land and design the layout of recommended buildings and other facilities such as subways. They also prepare materials that show how their programs can be carried out and the approximate costs.

Urban planners often confer with private land developers, civic leaders, and officials of public agencies that do specialized planning. They may prepare materials for community relations programs, speak at civic meetings, and appear before legislative committees to explain and defend their proposals.

In small organizations, urban planners must be able to do several kinds of work. In large organizations, planners usually specialize in areas such as physical design, community relations, or the reconstruction of run-down business districts.

Places of Employment

About 13,000 persons—about 10 percent of them women—were urban planners in 1974. Most work for city, county, or regional planning agencies. A growing number are employed by States or by the Federal Government in agencies dealing with housing, transportation, or environmental protection.

Many planners do consulting work, either part time in addition to a regular job, or full time working for a firm that provides services to private developers or government agencies. Urban planners also work for large land developers or research organizations and teach in colleges and universities.

Training, Other Qualifications, and Advancement

Employers often seek workers who have advanced training in urban planning. Two years of graduate study in city planning, or the equivalent in work experience, are required for most entry jobs in Federal, State, and local government agencies. Although the master's degree in planning is the usual requirement at the entry level, some people who have a bachelor's degree in city planning, architecture, landscape architecture, or engineering may qualify for beginning positions.

In 1974, over 60 colleges and universities gave a master's degree in urban planning. Although students holding a bachelor's degree in architecture or engineering may earn a master's degree after 1 year, most graduate programs in urban planning require 2 or 3 years to complete. Graduate students spend considerable time in workshops or laboratory courses learning to analyze and solve urban planning problems. Students often are required to work in a planning office part time or during the summer while they are earning the graduate degree.

Candidates for jobs in Federal, State, and local government agencies usually must pass civil service examinations to become eligible for appointment.

Planners must be able to think in terms of spatial relationships and to visualize the effects of their plans and designs. They should be flexible in their approaches to problems and be able to cooperate with others and reconcile different viewpoints to achieve constructive policy recommendations.

After a few years' experience, urban planners may advance to assignments requiring a high degree of independent judgment, such as outlining proposed studies, designing the physical layout of a large development, or recommending policy, program, and budget options. Some are promoted to jobs as planning directors, and spend a great deal of time meeting with offi-

cials in other organizations, speaking to civic groups, and supervising other professionals. Further advancement is more difficult at this level and often occurs through a transfer to a large city, where the problems are more complex and the responsibilities greater.

Employment Outlook

Employment of urban planners is expected to grow faster than the average for other occupations through the mid-1980's. In addition to opportunities created by future growth of this relatively small occupation, some jobs will open up because of the need to replace planners who leave their jobs.

The number of persons enrolled in graduate planning programs has risen rapidly in recent years. If this trend continues, the number of applicants may begin to outstrip available openings, leading to increased competition for jobs in this field. However, well qualified applicants should continue to find good employment prospects.

Future growth of the occupation will depend on the availability of money for the development of new communities and the restoration of older urban areas. Funding for these projects can be affected by shortages of mortgage money and higher costs for land, building materials, and necessary community services such as education and police and fire protection. Further, government programs to aid the development of community planning are subject to frequent review. Future levels of Federal spending will greatly influence the growth of urban planning projects.

Over the longrun, however, the Nation's need for good quality housing, transportation systems, health care, and other social services is expected to spur the demand for additional urban planners.

Earnings and Working Conditions

Starting salaries for urban planners were about $11,000 a year in 1974. Planners with a master's degree were hired by the Federal Government at $12,841 a year in late 1974. In some cases, persons having less than 2 years of graduate work could enter Federal service as interns at yearly salaries of either $8,500 or $10,520.

The salaries of directors of planning depend largely on the size of the city where they work. In 1974, for example, the median earnings of planning directors in the Nation's largest cities were well over $30,000 a year. In smaller towns, earnings may be less than half as large. Consultants earn fees that vary according to their reputation and previous experience.

Most planners have sick leave and vacation benefits and are covered by retirement and health plans. Although most city planners have a scheduled workweek of 40 hours, they sometimes work in the evening and on weekends to attend meetings with citizens' groups.

Sources of Additional Information

Facts about careers in planning and a list of schools offering training are available from:

American Institute of Planners, 1776 Massachusetts Ave. NW., Washington, D.C. 20036.

American Society of Planning Officials, 1313 East 60th St., Chicago, Ill. 60637.

SERVICE OCCUPATIONS

Workers in service occupations perform a wide variety of tasks ranging from policing streets and fighting fires to serving food and cleaning buildings. In 1974 nearly 11.4 million people were employed in service jobs. The major groups of service occupations are discussed below:

Food service occupations. The largest group of service workers, more than 3.5 million persons in 1974, prepared and served food in restaurants, schools, hospitals, and factory cafeterias. Workers in this group included cooks and chefs, waiters and waitresses, bartenders, and kitchen workers.

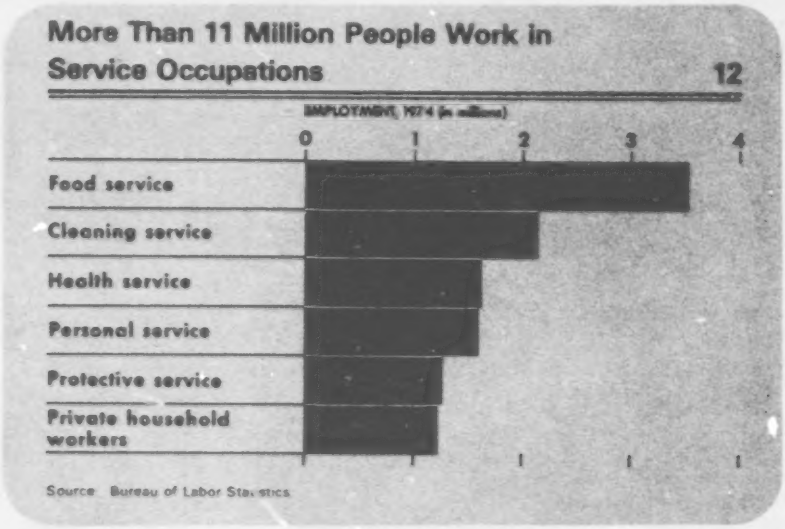
Cleaning and related occupations. Workers in these occupations clean and maintain buildings such as apartment houses, schools, and offices. Over 2.1 million persons were employed in these jobs in 1974. The group included janitors, building custodians, and pest controllers.

Health service occupations. More than 1.6 million persons were employed as health service workers in jobs such as practical nurse or hospital attendant. Most of these workers were employed in hospitals, but some worked in doctors' or dentists' offices.

Personal service occupations. Workers in this group range from barbers and cosmetologists to ski instructors and theater ushers. About 1.6 million persons were employed in personal service jobs.

Protective and related service occupations. More than 1.2 million people, or about one-tenth of all service workers, were employed to safeguard lives and property in 1974. The majority were police officers, guards, or firefighters. Most police officers and detectives were government employees, but some worked for hotels, stores, and other businesses. Guards, another large group of protective service employees, worked chiefly for private companies to protect their property and enforce company rules and regulations. Firefighters worked mainly for city governments. The remaining protective service workers were sheriffs and bailiffs, crossing guards and bridge tenders, and marshals and constables.

Private household service occupations. Most of the 1.2 million private household workers employed in 1974 were domestic workers who cleaned their empolyer's home, prepared meals, and cared for children. Some worked as launderers, caretakers, and companions.



Training, Other Qualifications, and Advancement

Training and skill requirements differ greatly among the various service occupations. FBI special agents, for example, must have a college degree. Barbers and cosmetologists need specialized vocational training. Still other occupations—household worker, building custodian, and hotel bellhop, for example—have no specific educational requirements for entry, although a high school diploma is always an advantage.

For many service occupations, personality traits and special abilities may be as important as formal schooling. Thus, physical strength and endurance are a necessity for work as a porter, lifeguard, or window cleaner; and a pleasing manner and appearance are especially important for a waiter or waitress, elevator operator, or usher. Other service workers, such as store and hotel detectives and travel guides,

need good judgment and should be skillful in dealing with people.

Some service workers eventually go into business for themselves as caterers or restaurant operators, for example, or proprietors of barber or beauty shops. Advancement from service occupations that require little training or skill may be difficult for people without a good basic education and some knowledge of the business in which they work.

Employment Outlook

Employment in the service occupations is expected to grow at about the same rate as the average for all occupations through the mid-1980's. The number of private household workers, however, has declined since the mid-1960's and this trend is expected to continue despite a strong demand for these workers. If private household workers are excluded from the total, service workers show a faster than average rate of growth.

Most of the future employment increase is expected to be among the health care and protective service occupations. Population growth and the relative aging of the population will cause the demand for all health care occupations to increase. The need for police officers, firefighters, and guards also will increase as population grows and urbanization continues.

Other occupations expected to grow faster than the average are cosmetologists, cooks and chefs, and waiters and waitresses. Rising incomes, increasing leisure time, and the growing number of women who combine family responsibilities and a job are likely to cause the demand for these workers to rise.

The following sections of the *Handbook* contain detailed information on most of the service occupations mentioned here. Others are described in the industry statements on government; transportation, communications, and public utilities; wholesale and retail trade; and service and miscellaneous industries. The health service occupations are included in the section on health care occupations, and statements on Meatcutters, Pest Controllers, and Funeral Directors can be found elsewhere in the *Handbook*.

CLEANING AND RELATED OCCUPATIONS

Every public building and apartment house needs to be kept clean and in good condition for the comfort and safety of the people who work or live there. Much of this work is done by persons in cleaning and related occupations. These workers may clean floors and windows in hospitals, change linens in hotels, repair broken faucets in apartments, or exterminate insects and rodents in office buildings.

Workers in these occupations usually learn their skills on the job, but other training is sometimes available. Building custodians may attend training programs offered by unions and government agencies; hotel housekeepers may take courses in housekeeping procedures and interior design offered by their employer.

Besides a knowledge of their job, these workers must be courteous, tactful, and neat if their job requires contact with the public. Some perform monotonous and tiring tasks, such as scrubbing and waxing floors, and must be able to stand the boredom of the job.

This section describes three cleaning and related occupations: Building Custodians, Pest Controllers, and Hotel Housekeepers and Assistants.

BUILDING CUSTODIANS

(D.O.T. 187.168, 381.137 and .887; 382.884, 891.138)

Nature of the Work

Building custodians, sometimes called janitors or cleaners, keep office buildings, hospitals, stores, and apartment houses clean and in good condition. They see that heating and ventilating equipment work properly, clean floors and windows, and do other necessary maintenance tasks. On a typical day, a custodian may wet- or dry-mop floors, vacuum carpets, dust furniture, make minor repairs, and exterminate insects and rodents. (See the statement on Pest Controllers elsewhere in the *Handbook* for more information on this occupation.)

Custodians use many different tools and cleaning materials. For one job they may need a mop and bucket; for another an electric polishing machine and a special cleaning solution. Chemical cleaners and power equipment have made many tasks easier and less time-consuming, but custodians must know how to use them properly to avoid harming floors and fixtures.

Some custodians supervise a group of custodial workers and are responsible for maintaining a section of a building or an entire building. They assign tasks to each worker, give instructions, and see that jobs, such as floor waxing or window washing, are done well.

Places of Employment

In 1974, more than 1.9 million people—75 percent of them men—worked as building custodians. One-third worked part time.

Most custodians worked in office buildings and factories, but schools, apartment houses, and hospitals also employed many. Some worked for firms supplying building maintenance services on a contract basis.

Although custodial jobs can be found in all cities and towns, most are located in highly populated areas where there are many office buildings, stores, and apartment houses.

Training, Other Qualifications, and Advancement

No special education is required for most custodial jobs, but the beginner should know simple arithmetic and be able to follow instructions. High school shop courses are helpful because minor plumbing or carpentry work may be a part of the job.

Most building custodians learn their skills on the job. Usually, beginners do routine cleaning and are given more complicated duties as they gain experience.

In some cities, unions and government agencies have developed programs to teach custodial skills. Students learn how to clean buildings thoroughly and efficiently, and how to operate and maintain machines, such as wet and dry vacuums, buffers, and polishers that they will use on the job. Instruction in minor electrical, plumbing, and other repairs is also given. As part of their training, students learn to plan their work, to deal with people who live or work in the buildings they clean, and to work without supervision. A few training programs offer remedial courses in reading, writing, and arithmetic.

Building custodians usually find work by answering newspaper advertisements, applying directly to a company where they would like to work, or applying to a building

maintenance service. They also get jobs through State employment offices. Custodial jobs in the government are obtained by applying to the civil service personnel headquarters.

Advancement opportunities for custodial workers are usually limited because the custodian is the only maintenance worker in many buildings. Where there is a large maintenance staff, however, custodians can be promoted to supervisory jobs. Having a high school diploma improves the chances for advancement. Some custodians go into business for themselves, maintaining buildings for clients for a fee.

Employment Outlook

Employment opportunities in this occupation are expected to be good through the mid-1980's. The need to replace workers who die, retire, or leave the occupation will create thousands of jobs each year. Construction of new office buildings, hospitals and apartment houses will increase the demand for maintenance services causing employment of custodians to grow about as fast as the average for all occupations.

Persons seeking part-time or evening work can expect to find many opportunities.

Earnings and Working Conditions

Earnings of building custodians vary by industry and area of the country; workers in large cities of the North Central region earn the highest wages. According to a Bureau of Labor Statistics survey of urban areas, custodians working in private industry had the following average hourly earnings in 1973-74.

Industry	*Average hourly earnings*
Manufacturing	$3.74
Public utilities	4.02
Wholesale trade	3.35
Retail trade	2.73
Finance	3.22
Services	2.57

Custodial workers generally earn about three-fourths as much as the average earnings for all nonsupervisory workers in private industry, except farming.

Custodians working in the Federal Government are paid at the same rates offered by private industries in the local area.

Most building service workers receive paid holidays and vacations, and health insurance.

Because most office buildings are cleaned during the evening while they are empty, custodians often work evening hours. In buildings requiring 24-hour maintenance, custodians may work a night shift.

Although custodians usually work inside heated, well-lighted buildings, they sometimes work outdoors sweeping walkways, mowing lawns, or shoveling snow. Working with machines can be noisy and some tasks, such as cleaning bathrooms and trash rooms, can be dirty. Custodial workers often suffer minor cuts, bruises, and burns caused by the machines, hand tools, and chemicals they use.

Building custodians spend most of their time on their feet, sometimes lifting or pushing heavy furniture or equipment. Many tasks, such as dusting or sweeping, require constant bending, stooping, and stretching.

Sources of Additional Information

Information about custodial jobs and training opportunities may be obtained from the local office of your State employment service.

For general information on job opportunities and wage rates in local areas, contact:

Service Employees International Union, 900 17th St. NW., Washington, D.C. 20006.

HOTEL HOUSEKEEPERS AND ASSISTANTS

(D.O.T. 321.138)

Nature of the Work

A hotel's or motel's reputation depends on how well it serves its guests. Although some offer economical accommodations and others stress luxurious surroundings and attentive service, all are concerned with their guests' comfort. Hotel housekeepers are responsible for keeping hotels and motels clean and attractive and providing guests with the necessary furnishings and supplies. It is their job to hire, train, schedule and supervise cleaners, linen and laundry workers, and repairers. They also keep employee records and order supplies. More than 18,000 persons, most of them women, worked as hotel housekeepers in 1974.

Housekeepers who work in small or middle-sized establishments may not only supervise the cleaning staff, but perform some of these duties themselves. In large or luxury hotels, their jobs are primarily administrative and they are frequently

called executive or head housekeepers.

Besides supervising a staff that may number in the hundreds, executive housekeepers prepare the budget for their departments; submit reports to the general manager on the condition of rooms, needed repairs, and suggested improvements; and purchase supplies and furnishings. Executive housekeepers are assisted by floor housekeepers, who supervise the cleaning and maintenance of one or several floors in the hotel, and assistant executive housekeepers, who help with the administrative work.

Some large hotel and motel chains assign executive housekeepers to special jobs, such as reorganizing housekeeping procedures in an established hotel or setting up the housekeeping department in a new motel.

Training, Other Qualifications, and Advancement

Although there are no specific educational requirements for housekeepers, most employers prefer applicants who have at least a high school diploma. Experience or training in hotel housekeeping also is helpful in getting a job.

Several colleges and universities offer instruction in hotel administration that includes courses in housekeeping, and some of these courses are offered in summer or evening classes. Many schools have developed programs under the guidance and approval of the National Executive Housekeepers Association. In addition, the American Hotel and Motel Association offers courses for either classroom or individual home study. Most helpful are courses on housekeeping; personnel management; budget preparation; interior decoration; and the purchase, use, and care of different types of equipment and fabrics.

Executive housekeepers should be good at planning and organizing work and must be able to get along well with people, especially those they supervise. Housekeepers also should like to work independently and be able to keep records and analyze numbers.

Although assistant housekeepers may be promoted to executive housekeepers after several years of experience, opportunities are limited because only one executive housekeeper job is available in any hotel or motel.

Employment Outlook

Employment of hotel housekeepers is expected to grow about as fast as the average for all occupations through the mid-1980's as additional hotels and motels are built. Most openings, however, will result from the need to replace workers who die, retire, or leave the occupation.

Because established hotels usually fill vacancies by promoting assistant housekeepers to executive housekeepers, beginners will find their best job opportunities in newly built motels or hotels. Competition is likely to be keen.

See the statement on the Hotel Industry elsewhere in the *Handbook* for information on earnings and working conditions, sources of additional information, and more information on the employment outlook.

Executive housekeepers usually use the telephone to place orders with suppliers or to inform the general manager of needed repairs or improvements in hotel guest rooms.

PEST CONTROLLERS

(D.O.T. 389.781 and 389.884)

Nature of the Work

Rats, mice, and common household insects, such as flies and roaches, contaminate food and spread sickness; termites can eat

away houses. Protection of our health and property from these pests is the job of professional pest controllers who are classified either as pest control route workers or termite specialists. Although these fields of work are separate, many controllers do both.

Pest control route workers service restaurants, hotels, food stores, homes and other customers who have problems with rats, mice, and common household insects. Since these pests can be difficult to stamp out, many customers have contracts for regular service. Route workers serving such commercial accounts may visit a dozen or more locations in 1 day, and return to most of them 1 week to a month later. Service to homes may require only one to four visits a year. Route workers usually work alone.

Termite specialists, on the other hand, may spend 1 day or more servicing a single building. Additional visits are seldom necessary, because a treatment usually keeps termites away for many years. Termite specialists frequently work in pairs or are assisted by helpers.

Pest controllers load their trucks or cars with chemical pesticides and other supplies and receive written instructions of services to be performed. Most customers are billed, but sometimes they pay the pest controller who keeps work records, including pesticides used and amount of time spent at each location.

To choose the safest and most effective pesticide for each job, route workers must know the habits and hiding places of different insects and rodents, what attracts them, and how they get into buildings. Route workers spray liquid—usually premixed—pesticides behind cabinets, under sinks, and in cracks and crevices. Dusting bulbs are used in some areas.

Traps or poisonous baits are placed near areas where rats or mice nest. Route workers must be careful not to apply poisons around areas where food is exposed or where there would be a danger to children or pets. Most of their work is fairly routine, but occasionally they handle an unusual job, such as removing bird nests from an attic.

Route workers tell customers how to correct conditions that attract pests. For example, they may recommend replacing damaged garbage containers, sealing open food containers, and repairing cracks in walls.

Subterranean termites, the most common wood-attacking insects, live in underground colonies and build mud "commuter tubes" to reach the house above. To destroy a colony, termite specialists put a poisonous chemical barrier between the colony and the wooden parts of the house. One way is to treat the soil around the foundation of the house using special tools attached to a pressure pump. To block all avenues of entry, however, it is sometimes necessary to get at the soil underneath masonry surfaces, such as basement floors and brick steps. Termite specialists drill holes through these surfaces, and pour or pump the chemical into the holes. They seal these holes with a cement like putty and replace any floor coverings, such as tiles, which had to be removed. Because termites will not cross treated areas, those in the ground must find food

Controllers know the habits and hiding places of different insects.

or starve and those trapped in the house die for lack of moisture.

Termite specialists sometimes have to alter buildings to prevent pests from returning. For example, they may raise foundations, install concrete flash walls, or insulate wood-to-earth contacts with concrete.

Helpers assist termite specialists by digging around and underneath houses, helping set up and operate equipment, and mixing cement, and doing general cleanup work.

Some highly experienced specialists inspect houses for termites, estimate costs, and explain the proposed work to customers. In most exterminating firms, however, the manager, supervisor, or pest control salesworkers do these jobs.

Places of Employment

More than half of the estimated 27,000 pest controllers employed in 1974 were route workers; the rest were termite specialists and combination route workers-termite specialists.

Most pest controllers work for or own firms that specialize in this service. A small number work for Federal, State, and local governments.

Jobs in this field can be found throughout the country. Employment, however, is concentrated in major metropolitan areas and large towns.

Training, Other Qualifications, and Advancement

Beginning pest controllers are trained by supervisors and experienced workers. Many large firms also provide several weeks of training, which includes classes on the characteristics of termites or other pests, the safe and effective use of pesticides, customer relations, and the preparation of work records. To aid beginners, many employers provide training manuals. Beginners gain practical experience by helping pest control route workers or termite specialists on the job. Most can complete training for routine work in one of these occupations after 2 to 3 months.

About 30 States currently require pest controllers to be licensed. In most States, the license is only for registration, but a few require applicants to pass a written examination. Beginning in October 1976, the Environmental Protection Agency will require that pest controllers be certified. All States will be required by law to give written or other tests to determine that pest controllers are able to use pesticides competently and safely.

Employers prefer trainees who are high school graduates, have safe driving records, and are in good health. Many firms require their employees to be bonded; applicants for these jobs must have a record of honesty and respect for the law. Because route workers frequently deal with customers, employers look for applicants who are courteous, tactful, and well-groomed. Termite specialists need manual dexterity and mechanical ability. Some firms give aptitude tests to determine an applicant's suitability for the work.

High school courses in chemistry and business arithmetic provide a helpful background for pest controllers. Students interested in becoming route workers also may benefit from courses in sales. Those interested in becoming termite specialists can gain valuable experience by taking courses related to building construction such as carpentry.

Experienced workers with ability can advance to higher paying positions, such as service manager or pest-control salesworkers.

Employment Outlook

Employment of pest controllers is expected to grow faster than the average for all occupations through the mid-1980's. In addition to the jobs resulting from employment growth, the need to replace experienced workers who retire or die or transfer to other occupations also will create many job openings.

Because pests reproduce rapidly and tend to develop resistance to pesticides, their control is a never ending problem. Population growth and further congestion of metropolitan areas will add to the need for more pest controllers. The deterioration of older buildings also is increasing the need for these workers, since buildings become more prone to infestation as they age.

Earnings and Working Conditions

The starting pay for inexperienced trainees ranged from $2.50 to $3 an hour in 1974, based on the limited information available. Earnings of experienced pest controllers ranged from $3 to $4.50 an hour.

Some route workers are paid an hourly rate or weekly salary. Others receive a commission based upon charges to customers. Nearly all termite specialists are paid an hourly rate or weekly salary.

On the average, pest controllers work 40 to 44 hours a week. During spring and summer, however, hours may be longer because pests are more prevalent. Most work is done during the day. Route workers, however, occasionally work nights because many restaurants and stores do not want them to work while customers are present.

Pest controllers work both indoors and outdoors in all kinds of weather. They frequently lift and carry equipment and materials, but most items weigh less than 50 pounds. Route workers also do a great deal of walking. Termite specialists occasionally must crawl under buildings and work in dirty, cramped spaces. Workers in these occupations are subject to some hazards. Although most pesticides

are not harmful to humans, some can cause injury if they are inhaled or left on the skin. Such injuries, however, are avoided if safety precautions are followed. Because they spend a lot of time driving, route workers have a relatively high exposure to traffic hazards. Termite specialists risk injury from power tools and sharp or rough materials in buildings.

Pest controllers are on their own to a great extent. They do not work under strict supervision and, within limits, may decide how they will handle a job.

Sources of Additional Information

Further information about opportunities in this field is available from local exterminating companies and the local office of the State employment service. General information about the work can be obtained from:

National Pest Control Association, Inc., 8150 Leesburg Pike, Vienna, Va. 22180.

FOOD SERVICE OCCUPATIONS

Food service workers make up one of the largest and fastest growing occupational groups in the Nation's labor force. There are more than three times as many persons employed in food service as there are in the production and refining of oil, automobile manufacturing, and steel manufacturing combined. In 1974 more than 3 1/2 million persons were employed in food service, mostly in restaurants, hotels, factory and school cafeterias, and catering firms. Job opportunities can be found almost everywhere, because even very small communities have roadside diners and school cafeterias.

There are no specific educational requirements for most food service work and skills usually can be learned on the job. Many restaurants hire inexperienced persons for jobs as dining room attendants, dishwashers, food counter workers, waiters and waitresses, and bartenders. Experience is sometimes needed, however, to get one of these jobs in a large restaurant or catering firm. Persons who want to become cooks usually must have some prior experience in a food service occupation, such as kitchen helper or assistant cook. Experienced workers may advance to food service manager, maitre d'hotel, head cook, or chef.

Vocational schools, both public and private, offer courses in cooking, catering, and bartending. Employment of food service workers is expected to increase faster than the average for all occupations through the mid-1980's. The demand for these workers will increase as new restaurants, cafeterias, and bars open in response to population growth and increased spending for food and beverages outside the home. Higher average incomes and more leisure time will allow people to eat out more often. Also, as an increasing number of wives work, families are finding dining out a welcome convenience. Detailed discussions of the work, training, outlook, and earnings of dining room attendants and dishwashers, food counter workers, waiters and waitresses, cooks and chefs, and bartenders are presented in the statements that follow.

BARTENDERS

(D.O.T. 312.878)

Nature of the Work

Cocktails range from the ordinary to the exotic and bartenders make these concoctions by combining different kinds of liquor with other ingredients such as soft drinks, soda water, bitters, fruit juices, and cream. There are dozens of combinations, and each one can be made in several ways. Because some people have preferences for certain cocktail recipes, bartenders are often asked to mix drinks to suit a customer's taste. Besides cocktails, bartenders also serve wine, draft or bottled beer, and a wide variety of nonalcoholic beverages.

Most bartenders take orders, serve drinks, and collect payment from customers. Others simply make drinks for waiters and waitresses to serve.

Bartenders usually are responsible for ordering and maintaining an inventory of liquor, mixes, and other bar supplies. They also arrange bottles and glasses to form a display, wash glassware, and clean the bar.

Bartenders in large restaurants or hotels usually have *bartender helpers* (D.O.T. 312.887) to assist them with their duties. Helpers keep the bar supplied with liquor, mixes, and ice; stock refrigerators with wine and beer; and replace empty beer kegs with full ones. They also keep the bar area clean and remove empty bottles and trash.

Places of Employment

Most of the 233,000 bartenders employed in 1974 worked in restaurants and bars, but many also had jobs in hotels and private clubs. Roughly one-fifth were self-employed.

Several thousand people tend bar part time, many of whom have full-time jobs in other occupations or attend college. Part-time workers often serve at banquets and private parties; usually they get these jobs through union clearinghouses.

A growing proportion of bartenders are women. About one-third were women in 1974, compared to only one-tenth in 1960.

Most bartenders work in the urban population centers of New York, California, and other large States, but many are employed in small communities also. Vacation resorts offer seasonal employment, and some bartenders alternate between summer and winter resorts rather than remain in one area the entire year.

Training, Other Qualifications, and Advancement

Most bartenders learn their trade on the job. Although preparing drinks at home can be good practice, it does not qualify a person to be a bartender. Besides knowing a

Most bartenders learn their trade on the job.

variety of cocktail recipes, bartenders must know how to stock a bar properly, and be familiar with State and local laws concerning the sale of alcoholic beverages.

Young persons who wish to become bartenders can get good experience by working as bartender helpers, dining room attendants, waiters, or waitresses. By watching the bartender at work, they can learn how to mix drinks and do other bartending tasks.

Some private schools offer short courses in bartending that include intruction on State and local laws and regulations, cocktail recipes, attire and conduct, and stocking a bar. Some of these schools help their graduates find jobs.

Bartenders should have pleasant personalities because they deal with the public. They need physical stamina, since they stand while they work and also may have to lift heavy kegs and cases.

Generally, bartenders must be at least 21 years of age, although some employers prefer those who are 25 or older. Some States require bartenders to have health certificates assuring that they are free from contagious diseases. In some instances, they must be bonded.

Small restaurants, neighborhood bars, and resorts usually offer a beginner the best entry opportunities. After gaining experience, a bartender may wish to work in a large restaurant or cocktail lounge where pay is higher and promotion opportunities are greater. Promotion may be to head bartender, wine steward, or beverage manager. Some bartenders open their own business.

Employment Outlook

Employment of bartenders is expected to increase faster than the average for all occupations through the mid-1980's. In addition to the job openings caused by employment growth, several thousand will arise annually from the need to replace experienced bartenders who retire, die, or transfer to other occupations.

The demand for bartenders will increase as new restaurants, hotels, and bars open in response to population growth and as the amount spent for food and beverages outside the home increases. Higher average incomes and more leisure time will allow people to go out for dinner or cocktails more often, and to take more vacations. Also, as more wives work, families are finding dining out a welcome convenience.

Job opportunities for bartenders should be especially favorable in States that have recently liberalized their drinking laws. In the early 1970's 25 States either lowered the drinking age or legalized the sale of liquor by the drink, or both, and some other States may follow suit.

Earnings and Working Conditions

Hourly earnings of bartenders ranged from $2.90 to $5.40 in 1974, according to limited data from union contracts in the restaurant industry. Besides wages, bartenders often receive tips that increase their earnings.

Bartenders usually receive free meals at work and may be furnished bar jackets or complete uniforms.

Many bartenders work more than 40 hours a week, and night and weekend work and split shifts are common. For many bartenders, however, the opportunity to socialize with customers and the possibility of someday managing or owning a bar or restaurant more than offset these disadvantages. For others, the

opportunity to get part-time work is important.

Sources of Additional Information

Information about job opportunities may be obtained from the Hotel and Restaurant Employees and Bartenders International Union, which is the principal union organizing bartenders, and from the State employment service.

For general information on job opportunities in bartending, write to:

National Institute for the Food Service Industry, 120 S. Riverside Plaza, Chicago, Ill. 60606.

COOKS AND CHEFS

(D.O.T. 313.131 through .887; 314.381 through .878; and 315.131 through .381)

Nature of the Work

A reputation for serving fine food is an asset to any restaurant, whether it prides itself on "home cooking" or exotic foreign cuisine. Cooks and chefs are largely responsible for the reputation a restaurant acquires. Many chefs have earned fame for both themselves and the restaurants and hotels where they work because of their skill in creating new dishes and improving familiar ones.

A cook's work depends partly on the size of the restaurant. Many small restaurants offer a limited number of short order dishes that are relatively simple to prepare, plus pies and other baked goods bought from bakeries. One cook usually prepares all of the food with the aid of a short order cook and one or two kitchen helpers.

Large eating places usually have more varied menus and prepare more of the food they serve. Kitchen staffs often include several cooks, sometimes called assistant cooks, and many kitchen helpers. Each cook usually has a special assignment and often a special job title—pastry, fry, or sauce cook, for example. Head cooks or chefs coordinate the work of the kitchen staff, and often direct certain kinds of food preparation. They decide the size of servings, sometimes plan menus, and buy food supplies.

Places of Employment

About 955,000 cooks and chefs were employed in 1974. Most worked in restaurants, but many worked in schools, colleges, and hospitals. Government agencies, factories, private clubs, and many other kinds of organizations also employed cooks and chefs.

Training, Other Qualifications, and Advancement

Most cooks acquire their skills on the job while employed as kitchen helpers although it is becoming common for cooks to have high school or post high school training in food preparation. Less frequently, they are trained as apprentices under trade union contracts or in the training programs some large hotels and restaurants have for new employees. Inexperienced workers usually can qualify as assistant or fry cooks after several months of on-the-job training, but acquiring all-round skills as head cook or chef in a fine restaurant often takes several years. High school or vocational school courses in business arithmetic and

A restaurant's reputation depends largely on the skills of its cooks.

business administration are helpful in becoming a cook or chef.

Persons who have had courses in restaurant cooking will have an advantage when looking for jobs in large restaurants and hotels where hiring standards are often high. Many vocational programs in both public and private high schools offer this kind of training to students. Other courses, ranging from a few months to 2 years or more, and open in some cases only to high school graduates, are given under the guidance of restaurant associations, hotel management groups, trade unions, and technical schools and colleges. The Armed Forces are also a good source of training and experience in food service work.

Although curricula may vary, students usually spend most of their time learning to prepare food through actual practice in well-equipped kitchens. Students learn to bake, broil, and otherwise prepare food, and to use and care for kitchen equipment. They also may be taught to select and store food, use leftovers, determine the size of portions, plan menus, and buy food supplies in quantity. Students also learn hotel and restaurant sanitation and public health rules for handling food.

Many school districts provide on-the-job training and sometimes summer workshops for cafeteria workers who wish to become cooks. School cooks are selected from employees who have participated.

Persons who want to become cooks or chefs should like to work with people in a team relationship and be able to work under pressure during busy periods. Cleanliness and a keen sense of taste and smell also are important qualifications. Most States require health certificates indicating that cooks and chefs are free from contagious diseases.

Many cooks acquire higher paying positions and new cooking skills by moving from restaurant to restaurant. Others advance to supervisory jobs. Some eventually go into business as caterers or restaurant owners; others may become instructors in vocational programs in high schools, junior and community colleges, and other institutions.

Employment Outlook

Employment of cooks and chefs is expected to increase faster than the average for all occupations through the mid-1980's. In addition to employment growth, thousands of job openings will arise annually from the need to replace experienced workers who retire, die, or transfer to other occupations.

The demand for cooks and chefs will increase as population grows and people spend more money on eating out. Higher personal incomes and more leisure time will allow people to go out for dinner more often and to take more vacations. Also, as an increasing number of wives work, more families are finding dining out a welcome convenience.

Small restaurants and other eating places having simple food preparation will provide the greatest number of starting jobs for cooks. However, beginners who have had training in restaurant cooking may find jobs available in hotels and restaurants where foods are prepared more elaborately.

Earnings and Working Conditions

In 1974, hourly pay rates ranged from $3 to $5.90 for chefs, from $2.60 to $4.90 for cooks of various types, and from $2.30 to $2.90 for assistant cooks, according to limited data from union contracts in several large metropolitan areas.

Wages of cooks and chefs vary depending on the part of the country and the type of establishment in which they work. Wages generally are higher in the West and in large, well-known restaurants and hotels. Cooks and chefs in famous restaurants earn much more than the minimum rates and several chefs with national reputations earn more than $40,000 a year. Hours in restaurants may include late evening, holiday, and weekend work, and range from 40 to 48 hours a week. Cooks employed in public and private schools work regular school hours during the school year only, usually for 9 months.

Many kitchens are air-conditioned and have convenient work areas and modern equipment. Others, particularly in older or smaller eating places, are often not as well equipped and working conditions may be less desirable. In all kitchens, however, cooks must stand most of the time, lift heavy pots and kettles, and work near hot ovens and ranges.

The principal union organizing cooks and chefs is the Hotel and Restaurant Employees and Bartenders International Union.

Sources of Additional Information

Information about job opportunities may be obtained from local employers, locals of the Hotel and Restaurant Employees and Bartenders International Union, and local offices of the State employment service.

General information about restaurant cooks and chefs is available from:

American Culinary Federation, P.O. Box 53, Hyde Park, N.Y. 12538.

Educational Director, National Institute for the Foodservice Industry, 120 South Riverside Plaza, Chicago, Ill. 60606.

The Educational Institute, American Hotel and Motel Association, 1407 S. Harrison Rd., Michigan State University, Stephen S. Nisbet Bldg., East Lansing, Mich. 48823.

The Council on Hotel, Restaurant and Institutional Education, 1522 K St. NW., Washington, D.C. 20005.

American Culinary Federation, 1407 S. Harrison Rd., Room 310, Michigan State University, Stephen S. Nisbet Bldg., East Lansing, Mich. 48823.

DINING ROOM ATTENDANTS AND DISHWASHERS

(D.O.T. 311.878 and 318.887)

Nature of the Work

Clean and attractive table settings are as important to a restaurant's reputation as the quality of food it serves. An egg-stained fork, soiled tablecloth, or empty salt shaker can make a customer unhappy. Dining room attendants and dishwashers provide the quick hands and sharp eyes needed to prevent such problems.

Attendants do many jobs that otherwise waiters would have to do. They clear and reset tables, carry dirty dishes from the dining area to the kitchen and return with trays of food, and clean up spilled food and broken dishes. By taking care of these details, attendants give waiters more time to serve customers.

In some restaurants, attendants also help by serving water and bread and butter to customers. When business is light, they do odd jobs like refilling salt and pepper shakers and cleaning coffee urns.

Dishwashers pick up where the attendants leave off—with the dirty dishes. They operate special machines that clean silverware and dishes quickly and efficiently. Occasionally, they may have to make minor adjustments to keep machines operating properly. Dishwashers scrub large pots and pans by hand. In addition, they clean refrigerators and other kitchen equipment, sweep and mop floors, and carry out trash.

Places of Employment

About 210,000 dishwashers and 160,000 attendants were employed in 197[illegible]. Many worked only part time.

Most attendants and dishwashers work in restaurants, bars, and hotels. Dishwashers also work in schools and hospitals.

Many dishwashers are students who work part-time.

Training, Other Qualifications, and Advancement

Little formal education is needed to qualify for jobs as dining room attendants and dishwashers. Many employers will hire applicants who do not speak English. Some mentally retarded persons can be trained as dishwashers.

Attendants and dishwashers must have good health and physical stamina because they stand most of the time and work at a fast pace during busy periods. State laws often require them to obtain health certificates to show that they are free of contagious diseases. Attendants must have a neat appearance and the ability to get along with people.

Although little education is needed to do these jobs, the ability to read, write, and do simple arithmetic is required for promotion. Typical lines of advancement are from attendant to waiter, and from dishwasher to cook's helper or short-order cook. Advancement opportunities generally are best in large restaurants.

Employment Outlook

Job openings for dining room attendants and dishwashers are expected to be plentiful in the years ahead. Most openings will result from the need to replace workers who find jobs in other occupations, retire, or die. Turnover is particularly high among part-time workers. About one-half of the attendants and dishwashers are students, most of whom work part time while attending school and then find other jobs after graduation.

Additional openings will result from employment growth. Employment is expected to increase about as fast as the average for all occupations through the mid-1980's as population growth and higher income create more business for restaurants.

Earnings and Working Conditions

Dining room attendants and dishwashers have relatively low earnings. Limited data from union contracts that cover restaurants and bars in several large cities indicate that hourly rates for these workers ranged from $1.30 to $3 in 1974. These amounts were below the average earnings of most other nonsupervisory workers in private industry, except farming.

Attendants may receive a percentage of waiters' tips in addition to wages. Tips often average between 10 and 20 percent of patrons' checks.

The majority of employers provide free meals at work and furnish uniforms. Paid vacations are customary, and various types of health insurance and pension plans may be offered.

Most attendants and dishwashers

work less than 30 hours a week. Some are on duty only a few hours a day during either the lunch or dinner period. Others work both periods but may take a few hours off in the middle of the day. Weekend and holiday work often is required.

Job hazards include the possiblity of falls, cuts, and burns, but injuries seldom are serious.

Sources of Additional Information

Information about job opportunities may be obtained from local employers, locals of the Hotel and Restaurant Employees and Bartenders International Union, and local offices of the State employment service. Names of local unions can be obtained from the Hotel and Restaurant Employees and Bartenders International Union, 120 East 4th St., Cincinnati, Ohio 45202.

For general information about dining room attendants and dishwashers, write to:

National Restaurant Association, One IBM Plaza, Suite 2600, Chicago, Ill. 60611.

Food counter worker takes order.

FOOD COUNTER WORKERS

(D.O.T. 311.878 and 319.878)

Nature of the Work

Counter workers serve customers in eating places that specialize in fast service and inexpensive food, such as hamburger and fried chicken carryouts, drugstore soda fountains, and school and public cafeterias. About 350,000 persons had food counter jobs in 1974, most of whom worked part time.

Typical duties of counter workers include taking customers' orders, serving food and beverages, making out checks, and taking payments. At drugstore fountains and in diners, they also may cook, make sandwiches and cold drinks, and prepare sundaes and other ice cream dishes. In hamburger carryouts, where food is prepared in an assembly-line manner, counter workers may take turns waiting on customers, making French fries, toasting buns, and doing other jobs.

Counter workers in cafeterias fill plates for customers and keep the serving line supplied with desserts, salads, and other dishes. Unlike other counter workers, they usually do not take payments and make change.

Counter workers also do odd jobs, such as cleaning kitchen equipment, sweeping and mopping floors, and carrying out trash.

Training, Other Qualifications, and Advancement

In the counter jobs that require totaling bills and making change, employers prefer to hire persons who are good in arithmetic and have attended high school, although a diploma usually is not necessary. There usually are no specific educational requirements for counter jobs in cafeterias.

Because counter workers deal with the public, a pleasant personality and neat appearance are important. Good health and physical stamina also are needed because they stand most of the time and work at a fast pace during busy periods. State laws often require counter workers to obtain health certificates to show that they are free of contagious disease.

Opportunities for advancement are limited, especially in small eating places. Some counter workers

move into higher paying jobs and learn new skills by transferring to a larger restaurant. Advancement can be to cashier, cook, waiter or waitress, or to counter or fountain supervisor.

Many large companies, such as the nationwide hamburger carryout chains, operate formal management training programs. Counter workers who show leadership ability may qualify for these programs.

Employment Outlook

Job openings for food counter workers are expected to be plentiful in the years ahead. Most openings will result from turnover—replacement of workers who find jobs in other occupations, retire, or die. Many counter workers are high school and college students who work part time while attending school and find jobs in other occupations after graduation. Because of the high turnover, jobs for counter workers are relatively easy to find.

Additional job openings will result from employment growth. Employment is expected to increase about as fast as the average for all occupations through the mid-1980's as population growth and higher income create more business for eating places.

Earnings and Working Conditions

Hourly rates for food counter workers ranged from $1.90 to $2.60 in 1974, based on limited data from union contracts that covered eating places in several large cities. These amounts were well below the average earnings for most other nonsupervisory workers in private industry, except farming. However, some counter workers, such as those in drugstores and diners, receive tips which can be greater than hourly wages. Tips usually average between 10 and 20 percent of patrons' checks. Counter workers usually receive free meals at work, and may be furnished with uniforms.

Most counter workers work less than 30 hours a week. Some are on duty only a few hours a day for either the lunch or dinner period. Many others work both periods, but may take a few hours off in the middle of the day. Flexible schedules often allow students to fit their working hours around their classes. Weekend and holiday work often is required.

Job hazards include the possibility of falls, cuts, and burns; but injuries seldom are serious.

Sources of Additional Information

Information about job opportunities may be obtained from local employers, locals of the Hotel and Restaurant Employees and Bartenders International Union, and local offices of the State employment service. Names of local unions are available from the Hotel and Restaurant Employees and Bartenders International Union, 120 East 4th St., Cincinnati, Ohio 45202.

For general information about food counter workers, write to:

National Restaurant Association, One IBM Plaza, Suite 2600, Chicago, Ill. 60611.

MEATCUTTERS

(D.O.T. 316.781, 316.884)

Nature of the Work

Meatcutters prepare meat, fish, and poultry in supermarkets or wholesale food outlets. Their primary duty is to divide animal carcasses into steaks, roasts, chops, and other serving-sized portions. They also may prepare meat products such as sausage and corned beef. Cutters who work in retail foodstores may set up counter displays and wait on customers.

In preparing a beef carcass, meatcutters divide it into halves with a band saw, and then into quarters by cutting each half between the ribs with a knife and sawing through the backbone. A saw or knife is used to divide the quarters into primal cuts such as T-bone steaks or rib roasts. Meatcutters divide the primal cut into pieces small enough for an average serving.

Meatcutters use a butcher knife or slicer to divide boneless cuts and a band saw or cleaver to divide pieces that contain bones. Any bone chips left on the meat are scraped off with a knife or brushed off by a machine. Cutters grind trimmings into hamburger.

Places of Employment

About 200,000 persons worked as meatcutters in 1974. They had jobs in almost every city and town in the Nation. Most meatcutters worked in retail foodstores. A few worked in wholesale stores, restaurants, hotels, hospitals, and other institutions.

Training, Other Qualifications, and Advancement

Meatcutters acquire their skills on the job either informally or through apprenticeship programs. Generally, trainees begin by doing odd jobs, such as removing bone chips from retail cuts. Under the guidance of skilled meatcutters, they learn about the various cuts and grades of meats and the proper use of tools and equipment. After demonstrating skill with tools, they learn to divide primal cuts into individual portions and to divide quarters into primal cuts. Trainees may learn to cut and prepare fish and poultry, roll and tie roasts, prepare sausage, and cure and corn meat. Later, they may learn marketing operations such as inventory control, meat buying and grading, and recordkeeping.

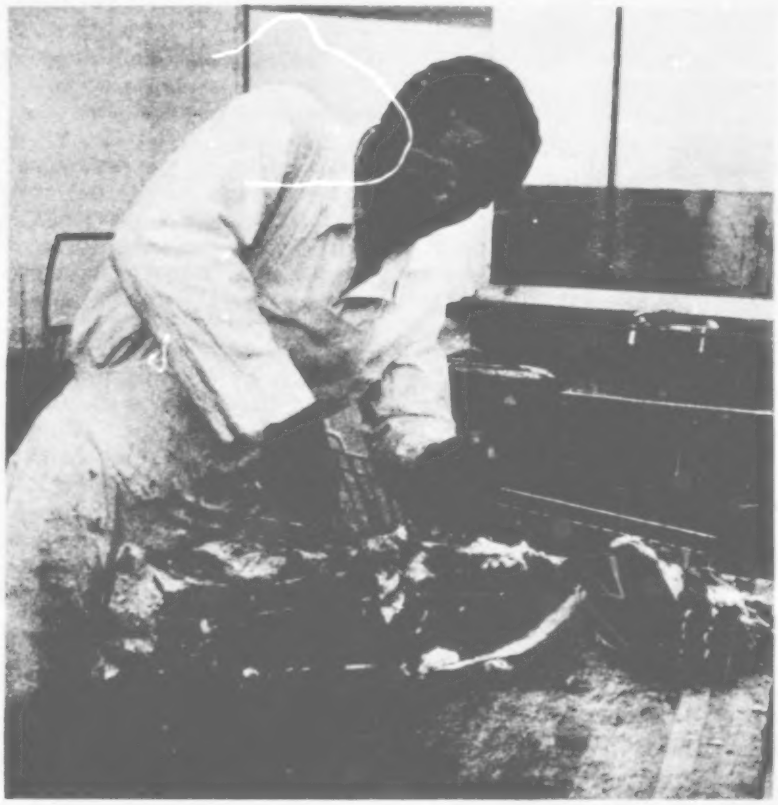
Meatcutters who learn the trade through apprenticeship generally

complete 2 to 3 years of supervised on-the-job training which may be supplemented by some classroom work. At the end of the training period, apprentices are given a meatcutting test which is observed by their employer. A union member is also present in union shops. Apprentices who pass the test qualify as meatcutters. Those who fail can take the test again at a later time. In many areas, apprentices may become meatcutters in less than the usual training time if they can pass the test.

Employers prefer applicants who have a high school diploma and the potential to develop into meat department managers. High school or vocational school courses in business arithmetic are helpful in weighing and pricing meats and in making change.

Manual dexterity, good depth perception, color discrimination, and good eye-hand coordination are important in cutting meat. A pleasant personality, a neat appearance, and the ability to communicate clearly also are important qualifications when cutters wait on customers. Better than average strength is necessary since cutters work standing up and often lift heavy loads. In some communities, a health certificate may be required for employment.

Meat cutters may progress to supervisory jobs, such as meat department managers in supermarkets. A few become meat buyers for wholesalers and supermarket chains. Some cutters open their own meat markets or retail foodstores.



Meat cutter slices beef into retail cuts.

Employment Outlook

Little change in the number of meatcutters is expected through the mid-1980's. Nevertheless, thousands of entry jobs will be available as experienced workers retire, die, or transfer to other occupations.

Central cutting, the practice of having one location at which meat for several stores is cut and wrapped, will limit the demand for meatcutters. Central cutting, which permits meatcutters to specialize in both a type of meat and a type of cut, increases efficiency. This specialization also reduces the amount of training and skill necessary to become a cutter.

Earnings and Working Conditions

According to union contracts in six large cities, hourly earnings of most meatcutters ranged from about $4.70 to $6.80 in 1974.

Beginning apprentices usually receive between 60 and 70 percent of the experienced cutter's wage and generally receive increases every 6 to 8 months.

Cutters work in coldrooms designed to prevent meat from spoiling. They must be careful when working with sharp tools, especially those that are powered.

Most cutters are members of the Amalgamated Meat Cutters and Butcher Workmen of North America.

Sources of Additional Information

Information about work opportunities can be obtained from local employers or local offices of the State employment service. For information on training and other aspects of the trade, contact:

American Meat Institute, 59 East Van Buren St., Chicago, Ill. 60605

Amalgamated Meat Cutters and Butcher Workmen of North America, 2800 North Sheridan Rd., Chicago, Ill. 60657

WAITERS AND WAITRESSES

(D.O.T. 311.138 through .878)

Nature of the Work

Waiters and waitresses take customers' orders, serve food and beverages, make out checks, and sometimes take payments. In diners, coffee shops, and other small restaurants they provide fast, efficient service. In other restaurants, waiters and waitresses serve food at a more leisurely pace and offer more personal service to their customers. For example, they may suggest wines and explain the preparation of items on the menu.

Waiters and waitresses may have duties other than waiting on tables. They set up and clear tables and carry dirty dishes to the kitchen. In very small restaurants they may combine waiting on tables with counter service, preparing sandwiches, or cashiering. In large restaurants and in places where meal service is formal, waiters and waitresses are relieved of most additional duties. Dining room attendants often set up tables, fill water glasses, and do other routine tasks.

Places of Employment

About 1,180,000 waiters and waitresses were employed in 1974. More than half worked part time (less than 35 hours a week). Most worked in restaurants; some worked in hotels, colleges, and factories that have restaurant facilities. Jobs are located throughout the country but are most plentiful in large cities and tourist areas. Vacation resorts offer seasonal employment and some waiters and

About one-fourth of waiters and waitresses are students, most of whom work part-time.

waitresses alternate between summer and winter resorts instead of remaining in one area the entire year.

Training, Other Qualifications, and Advancement

Most employers prefer to hire applicants who have had at least 2 or 3 years of high school. Although most waiters and waitresses pick up their skills on the job, some public and private schools and restaurant associations offer special training.

A neat appearance, an even disposition, and stamina are important qualifications. Waiters and waitresses also should be good at arithmetic and, in a few restaurants, knowledge of a foreign language is helpful. State laws often require waiters and waitresses to obtain health certificates showing that they are free of contagious diseases.

In most small eating places opportunities for promotion are limited. After gaining experience, however, a waiter or waitress may transfer to a larger restaurant where earnings and prospects for advancement may be better. Advancement can be to cashier or supervisory jobs, such as maitre d'hotel, headwaiter, or hostess. Some supervisory workers advance to jobs as restaurant managers.

Employment Outlook

Job openings are expected to be plentiful in the years ahead, mainly due to the need to replace the waiters and waitresses who find other jobs or who retire, die, or stop working for other reasons. Turnover is particularly high among part-time workers. About one-fourth of the waiters and waitresses are students, most of whom work part-time while attending school and then find other jobs after graduation. In addition to the job openings from turnover, many will result from employment growth.

Employment of waiters and waitresses is expected to grow about as fast as the average for all occupations through the mid-1980's as population growth and higher incomes create more business for restaurants. Higher incomes and more leisure time will permit people to eat out more often. Also, as an increasing number of wives work, more and more families may find dining out a welcome convenience.

Beginners will find their best opportunities for employment in the thousands of informal restaurants. Those who seek jobs in swank restaurants may find keen competition for the jobs that become available.

Earnings and Working Conditions

Hourly rates for waiters and waitresses (excluding tips) ranged from $1.20 to $3 in 1974, according to limited data from union contracts that covered eating and drinking places in several large cities. For many waiters and waitresses, however, tips are greater than hourly wages. Tips

generally average between 10 and 20 percent of guests' checks. Most waiters and waitresses receive meals at work and many are furnished with uniforms.

Some waiters and waitresses work split shifts—that is, they work for several hours during the middle of the day, take a few hours off in the afternoon, and then return to their jobs for the evening hours. They also may work on holidays and weekends. The wide range in dining hours creates a good opportunity for part-time work. Waiters and waitresses stand most of the time and often have to carry heavy trays of food. During dining hours they may have to rush to serve several tables at once. The work is relatively safe, but they must be careful to avoid slips or falls, and burns.

The principal union organizing waiters and waitresses is the Hotel and Restaurant Employees and Bartenders International Union.

Sources of Additional Information

Information about job opportunities may be obtained from local employers, locals of the union previously mentioned, and local offices of the State employment service. General information on waiter and waitress jobs is available from:

National Institute for the Food Service Industry, 120 South Riverside Plaza, Chicago, Ill. 60606.

Council on Hotel, Restaurant, and Institutional Education, 1522 K St. NW., Washington, D.C. 20005.

PERSONAL SERVICE OCCUPATIONS

Personal service workers perform difficult or time-consuming tasks for people, such as cleaning and pressing clothes; carrying baggage, or arranging funerals. Some of these tasks require special skills that must be learned through formal training; others require skills that can be learned on the job. For some personal service jobs, workers must obtain State licenses after completing a training program or apprenticeship.

Persons entering these occupations should be neat, tactful and able to get along well with people because success on the job depends on the impression personal service workers make on their customers. Physical stamina is necessary for those jobs that involve lifting heavy objects or standing for long periods of time.

Personal service workers may receive salaries, commissions or both. In many cases they also receive tips that add substantially to their income. Employers often furnish uniforms for jobs that require them. Some workers, like barbers and cosmetologists, must provide their own tools.

This section describes four personal service occupations: Barbers, Cosmetologists, Funeral Directors and Embalmers, and Bellhops and Bell Captains.

BARBERS

(D.O.T. 330.371)

Nature of the Work

Although most men go to a barber for just a haircut, other services such as hairstyling and coloring are becoming increasingly popular. Barbers trained in these areas are called "hairstylists" and work in styling salons, unisex salons, and some barbershops. They cut and style hair to suit each customer and may color or straighten hair and fit hair pieces. All barbers offer hair and scalp treatments, shaves, facial massages, and shampoos.

A small but growing number of barbers cut and style women's hair. They usually work in unisex salons and may have male and female customers. Most States require a cosmetologist's license as well as a barber's license, however, to permanent wave or color women's hair.

As part of their responsibilities, barbers keep their scissors, combs and other instruments sterilized and in good condition. They clean their work areas and may sweep the shop as well. Those who own or manage a shop have additional responsibilities such as ordering supplies, paying bills, keeping records, and hiring employees.

Places of Employment

Most of the 130,000 barbers in 1974 worked in barbershops. Some worked in unisex salons, and a few worked for government agencies, hotels or department stores. More than half of all barbers operated their own businesses.

About 95 percent of all barbers are men.

All cities and towns have barbershops, but employment is concentrated in the most populous cities and States. Hairstylists usually work in large cities where the greatest demand for their services exists.

Training, Other Qualifications, and Advancement

All States require barbers to be licensed. The qualifications necessary to get a license vary from one State to another, however. Generally a person must be a graduate of a State-approved barber school, have completed the eighth grade, pass a physical examination, and be at least 16 (in some States 18) years old.

Nearly all States require a beginner to take an examination for an apprentice license, and serve 1 or 2 years as an apprentice before taking the examination required for a license as a registered barber. In the examinations, the applicant usually is required to pass a written test and demonstrate an ability to perform the basic services. Fees for these examinations range from $5 to $75. A few States do not charge a fee for the apprentice examination.

Because most States do not recognize training, apprenticeship work, or licenses obtained in another State, persons who wish to become barbers should review the laws of the State in which they want to work before entering a barber school.

Barber training is offered in many public and private schools and a few vocational schools. Courses usually last 6 to 12 months.

Trainees buy their own tools which cost about $200. They study the basic services—haircutting, shaving, facial massaging, and hair and scalp treatments—and, under supervision, practice on fellow students and on customers in school "clinics." Besides attending lectures on barber services and the use and care of instruments, students take courses in sanitation and hygiene, and learn how to recognize certain skin conditions. Instruction also is given in selling and general business practices. Advanced courses are available in some localities for barbers who wish to update their skills or specialize in hairstyling, coloring, and the sale and service of hairpieces.

Dealing with customers requires patience and a better than average disposition. Good health and stamina also are important because barbers stand a great deal and work with both hands at shoulder level—a position that can be tiring.

Beginners may get their first jobs through the barber school they attended, or through the local barber's union or employer's association.

Some experienced barbers advance by becoming managers of large shops or by opening their own shops. A few may teach at barber schools. Barbers who go into business for themselves must have the capital to buy or rent a shop and install equipment. New equipment for a one-chair shop cost from $1,500 to $2,800 in 1974. Some shopowners buy used equipment and fixtures at reduced prices, however.

Employment Outlook

The employment decline of the last decade is expected to level off by the mid-1980's as population growth and the increasing popularity of hairstyling offset the effect of the fashion for longer hair. Although little change is expected in the level of employment, several thousand job openings will result each year from the need to replace workers who retire, die, or transfer to other occupations. Replacement needs are relatively high because barbers are somewhat older, on the average, than workers in other occupations.

The shift in consumer preferences from regular haircuts to more personalized and intensive services has greatly affected the occupation. Barbers who specialize in hairstyling have been more successful than those who offer conventional services. This trend is expected to continue, and employment will probably decline in the short run.

In the long run, however, employment prospects should improve as population growth and the increasing popularity of hairstyling cause the demand for barbering services to rise. Employment opportunities should be better for hairstylists than for regular barbers.

Earnings and Working Conditions

Barbers receive income from commissions or wages and tips. Most barbers who are not shopowners normally receive 65 to 75 percent of the money they take in; a few are paid straight salaries.

Weekly earnings of experienced barbers (including tips) generally ranged between $175 and $225 in 1974, according to limited information available. Hairstylists usually earned $275 to $350 a week, because the services they provide are more personalized and therefore more expensive. Some hairstylists and a few barbers who operated their own shops earned more than $400 a week. Beginning barbers usually earn about $155 to $175 a week, hairstylists $175 to $225 a week.

Earnings depend on the size and location of the shop, customers' tipping habits, competition from other barbershops, and the barber's ability to attract and hold regular customers.

Most full-time barbers work more than 40 hours a week and a workweek of over 50 hours is not uncommon. Although Saturdays and lunch hours are generally very busy, a barber may have some time off during slack periods. To assure an even workload, some barbers ask customers to make appointments. Under some union contracts, barbers receive 1- or 2-week paid vacations, insurance, and medical benefits.

The principal union which organizes barbers—both employees and shopowners—is the Journeymen Barbers, Hairdressers, Cosmetologists and Proprietors' International Union of America. The principal professional association which represents and organizes shopowners, managers and employees is the Associated Master Barbers and Beauticians of America.

Sources of Additional Information

Information on State licensing requirements and approved barber schools is available from the State Board of Barber examiners or other State authority at each State capital.

For general information on training facilities and State licensing laws, contact:

National Association of Barber Schools, Inc. 361 24th St., Ogden, Utah 84401.

Additional information on this occupation is available from:

Associated Master Barbers and Beauticians of America, 219 Greenwich Road, P.O. Box 17782, Charlotte, N.C. 28211.

National Barber Career Center, 3839 White Plains Road, Bronx, N.Y. 10467.

Information on barber schools is available from:

National Association of Trade and Technical Schools, 2021 L St. NW., Room 440, Washington, D.C. 20036.

BELLHOPS AND BELL CAPTAINS

(D.O.T. 324.138 and .878)

Nature of the Work

Bellhops carry baggage for hotel and motel guests and escort them to their rooms on arrival. When showing new guests to their rooms, bellhops make sure everything is in order and may offer information about valet services, dining room hours, or other hotel services. Bellhops also run errands for guests and may relieve elevator operators or switchboard operators.

Large and medium-sized hotels employ bell captains to supervise bellhops on the staff. They plan work assignments, record the hours each bellhop is on duty, and train new employees. Bell captains take care of any unusual requests guests may make and handle any complaints regarding their department. Sometimes they help arriving or departing guests if a bellhop is unavailable. In 1974, more than 17,000 persons, most of them men, worked as bellhops and bell captains.

A few hotels have large service departments and employ superintendents of service to supervise bell captains and bellhops, elevator operators, doorkeepers, and washroom attendants.

Training, Other Qualifications, and Advancement

No specific educational requirements exist for bellhops, although high school graduation improves the chances for promotion to a job as desk clerk or reservation clerk. Many hotels fill bellhop jobs by promoting elevator operators.

Because bellhops have frequent contact with guests, they must be neat, tactful, and courteous. A knowledge of the local area is an asset because guests often ask about local tourist attractions, restaurants, and transportation services. Bellhops also must be able to stand for long periods, carry heavy baggage, and work independently.

Bellhops can advance to bell captain and then to superintendent of service, but opportunities are limited. Because there is only one bell captain position in each hotel, many years may pass before an opening occurs. Opportunities for advancement to superintendent of service are even fewer.

Employment Outlook

Employment of bellhops is expected to grow more slowly than the average for all occupations through the mid-1980's. Most openings, however, will result from the need to replace workers who die, retire, or leave the occupation.

Although many motels now offer services similar to those of a hotel and employ bellhops, the growing popularity of economy motels that offer only basic services is expected to limit employment growth. New workers will have better opportunities in motels and small hotels because the large luxury hotels prefer to hire experienced workers. Opportunities also will be available in resort areas where hotels and motels are open only part of the year.

See the statement on the Hotel Industry elsewhere in the *Handbook* for information on earnings and working conditions, sources of additional information, and more information on employment outlook.

COSMETOLOGISTS

(D.O.T. 332.271 and .381; 331.878 and 339.371)

Nature of the Work

Hair has been a center of attention since women and men first began to care about their appearance. Throughout history a great deal of effort has gone into acquiring a fashionable hairstyle or a perfectly trimmed beard. Although styles change from year to year, the cosmetologist's task remains the same; to help people look attractive.

Cosmetologists, who also are called *beauty operators*, *hairdressers*, or *beauticians*, shampoo, cut and style hair, and advise customers on how to care for their hair. Frequently they straighten or permanent wave a customer's hair to keep the style in shape. Cosmetologists may also lighten or darken the color of the hair to better suit the customer's skin color. Cosmetologists may give manicures and scalp and facial treatments, provide makeup analysis for women, and clean and style wigs and hairpieces.

Most cosmetologists make appointments and keep records of hair color formulas and permanent waves used by their regular customers. They also keep their work area clean and sanitize their hairdressing implements. Those who operate their own salons also have managerial duties which include hiring and supervising workers, keeping records, and ordering supplies.

Places of Employment

Most of the 500,000 cosmetolo-

gists employed in 1974 worked in beauty salons. Some worked in unisex shops, barber shops, or department stores, and a few were employed by hospitals and hotels. More than a third operated their own businesses.

Over 90 percent of all cosmetologists are women, and the proportion of men in the occupation has declined slightly in recent years.

All cities and towns have beauty salons, but employment is concentrated in the most populous cities and States. Those cosmetologists who set fashion trends with their hairstyles usually work in New York City, Los Angeles, and other centers of fashion and the performing arts.

Training, Other Qualifications, and Advancement

Although all States require cosmetologists to be licensed, the qualifications necessary to obtain a license vary. Generally, a person must have graduated from a State-approved cosmetology school, have completed at least the 10th grade, pass a physical examination, and be at least 16 years old. In some States completion of an apprenticeship training program can substitute for graduation from a cosmetology school, but very few cosmetologists learn their skills in this way.

Cosmetology instruction is offered in both public and private vocational schools, in either daytime or evening classes. A daytime course usually takes 6 months to 1 year to complete; an evening course takes longer. Many public school programs include the academic subjects needed for a high school diploma and last 2 to 3 years. An apprenticeship program usually lasts 1 or 2 years.

Both public and private programs include classroom study, demonstrations, and practical work. Most schools provide students with the necessary hairdressing implements, such as scissors, razors, and hair rollers, and include their cost in the tuition fee. Sometimes students must purchase their own. A good set of implements costs about $65.00. Beginning students work on manikins or on each other. Once they have gained some experience, students practice on customers in school "clinics."

During a make-up analysis, cosmetologists show customers how to care for their skin and enhance their appearance by using make-up.

After graduating from a cosmetology course, students take the State licensing examination. The examination consists of a written test and a practical test in which applicants demonstrate their ability to provide the required services. In some States an oral examination is included and the applicant is asked to explain the procedures he or she is following while taking the practical test. In some States a separate examination is given for persons who want only a manicurist's license. Most States have reciprocity agreements that allow a cosmetologist licensed in one State to work in another without re-examination.

Persons who want to become cosmetologists must have finger dexterity, a sense of form and artistry, and the physical stamina to stand for long periods of time. They should enjoy dealing with the public and be willing and able to follow customers' instructions. Because hairstyles are constantly changing, cosmetologists must keep abreast of the latest fashions and beauty techniques. Business skills are important for those who plan to operate their own salons.

Practically all schools help their students find jobs. During their first

months on the job, new cosmetologists are given relatively simple tasks, such as giving manicures or shampoos, or are assigned to work on customers who are not regular patrons. Once they have demonstrated their skill, they are assigned to regular customers and perform the more complicated tasks of styling, coloring, and permanent waving hair.

Advancement usually is in the form of higher earnings as cosmetologists gain experience and build a steady clientele; but many manage large salons or open their own after several years of experience. Some teach in cosmetology schools or use their knowledge and skill to demonstrate cosmetics in department stores. A few work as inspectors for State cosmetology boards.

Employment Outlook

Employment of cosmetologists is expected to grow about as fast as the average for all occupations through the mid-1980's as population increases and the number of working women rises. The trend to hairstyling for men also creates a demand for these workers because many men go to unisex shops or beauty salons for styling services. In addition to openings due to growth in the occupation, thousands of cosmetologists will be needed each year to replace those who die, retire, or leave the occupation.

Some cosmetologists work for manufacturers of hair-care products and demonstrate hair-cutting and styling techniques at trade shows and conventions.

Employment in this occupation is not strongly affected by downturns in the business cycle, and job opportunities are expected to be good for both newcomers and experienced cosmetologists. Many openings should be available for persons seeking part-time work.

Earnings and Working Conditions

Cosmetologists receive income from commissions or wages and from tips. Those who are not shop owners receive a percentage of the money they take in, usually 50 percent; a few are paid straight salaries.

Weekly earnings of experienced cosmetologists (including tips) generally ranged between $250 and $300 in 1974, according to limited information available. After 10 years of experience, they can earn more than $400 a week. Beginners usually earned $75 to $100 a week.

Those cosmetologists who cut and style men's hair often earn more than those who work on women's hair because the services they provide are more expensive. The few cosmetologists who set hairstyle trends earn $1,000 a week or more.

Earnings also depend on the size and location of the salon, customers' tipping habits, competition from other beauty salons, and the individual cosmetologist's ability to attract and hold regular customers.

Many full-time cosmetologists work more than 40 hours a week, including evenings and Saturdays when beauty salons are busiest. More than one-third of all cosmetologists work part time, usually during these busy hours.

A few large salons and department stores offer group life and health insurance and other benefit plans. Nearly all employers provide annual paid vacations of at least 1 week after a year's service.

The principal union which organizes cosmetologists—both employees and salon owners—is the Journeymen Barbers, Hairdressers, Cosmetologists, and Proprietor's International Union of America. The principal trade association which represents and organizes salon owners and managers is the Associated Master Barbers and Beauticians of America. Other organizations include the National Hairdressers and Cosmetologists Association, Inc.; the National Association of Cosmetology Schools, Inc., which represents school owners and teachers; and the National Beauty Culturists' League, representing black cosmetologists, teachers, managers, and salon owners.

Sources of Additional Information

A list of approved training schools and licensing requirements can be obtained from State boards of cosmetology. Additional information about careers in cosmetology and State licensing requirements is available from:

National Beauty Career Center, 3839 White Plains Rd., Bronx, N.Y. 19467.

National Hairdressers and Cosmetologists Association, 3510 Olive St., St. Louis, Mo. 63103.

For general information about the occupation, contact:

Journeymen Barbers, Hairdressers, Cosmetologists, and Proprietors International Union of America, 7050 West Washington St., Indianapolis, Ind. 46241.

National Association of Cosmetology Schools, 599 South Livingston Ave., Livingston, N.J. 07039.

FUNERAL DIRECTORS AND EMBALMERS

(D.O.T. 187.168 and 338.381)

Nature of the Work

Few occupations require the tact, discretion, and compassion called for in the work of funeral directors and embalmers. The family and friends of the deceased may be under considerable emotional stress and bewildered by the many details of the occasion. The *funeral director* (D.O.T. 187.168) helps them to make the personal and business arrangements necessary for the service and burial. The *embalmer* (D.O.T. 338.381) prepares the body for viewing and burial. In many instances, one person performs both functions.

The director's duties begin when a call is received from a family requesting services. After arranging for the deceased to be removed to the funeral home, the director obtains the information needed for the death certificate, such as date and place of birth and cause of death. The director makes an appointment with the family to discuss the details of the funeral. These include: time and place of service; clergy and organist; selection of casket and clothing, and provisions for burial or cremation. Directors also make arrangements with the cemetery, place obituary notices in newspapers, and take care of other details as necessary. Directors must be familiar with the funeral and burial customs of various religious faiths and fraternal organizations.

Embalming is a sanitary and preservative measure, and under certain circumstances, such as delayed burials, is required by law. Embalmers, perhaps with the help of apprentices, first wash the body with germicidal soap. The embalming process itself replaces the blood with a preservative fluid. Embalmers apply cosmetics to give the body a natural appearance and, if necessary, restore disfigured features. Finally, they dress the body and place it in the casket selected by the family.

On the day of the funeral, directors provide cars for the family and pallbearers, receive and usher guests to their seats, and organize the funeral procession. After the service they may help the family file claims for social security, insurance, and other benefits. Directors may serve a family for several months following the funeral until such matters are satisfactorily completed.

Places of Employment

About 45,000 persons were licensed as funeral directors and embalmers in 1974. A substantial number of the directors were funeral home owners.

Most of the 23,000 funeral homes in 1974 had 1 to 3 directors and embalmers, including the owner. Many large homes, however, had 20 or more. Besides the embalmers employed by funeral homes, several hundred worked for morgues and hospitals.

Training, Other Qualifications, and Advancement

A license is needed to practice embalming. State licensing standards vary but generally an embalmer must be 21 years old, have a high school diploma or its equivalent, graduate from a mortuary science school, serve an apprenticeship, and pass a State board examination. One-half of the States require a year or more of college in addition to training in mortuary science.

All but six States also require funeral directors to be licensed. Qualifications are similar to those for embalmers, but directors may have special apprenticeship training and board examinations. Most people entering the field obtain both licenses. Information on licensing requirements is available from the State office of occupational licensing.

High school students can start preparing for a career in this field by taking courses in biology, chemistry, and speech. Students may find a part-time or summer job in a funeral home. Although these jobs consist mostly of maintenance and clean-up tasks, such as washing and polishing hearses, they can be helpful in gaining familiarity with the operation of funeral homes.

In 1974, 28 schools had mortuary science programs accredited by the American Board of Funeral Service Education. About one-half were private vocational schools that offer 1-year programs emphasizing basic subjects such as anatomy and physiology, as well as practical skills, such as embalming techniques and restorative art. A small number of colleges and universities offer 2-year and 4-year programs in funeral service. These programs included liberal arts and management courses as well as mortuary science. All programs offered courses in psychology, accounting, and funeral law.

Apprentices work under the guidance of experienced embalmers and directors. An apprenticeship usually lasts 1 or 2 years and may be served before, after, or during the time one attends mortuary school, depending on State regulations.

State board examinations consist of written and oral tests and actual demonstrations of skills. After passing the examination, apprentices receive a license to practice. If they want to work in another State they may have to pass its examination, although many States have mutual agreements which make this unnecessary.

Important personal traits for funeral directors are composure, tact, and the ability to communicate easily with the public. They also should have the desire and ability to comfort people in their time of sorrow.

Advancement opportunities are best in large funeral homes where directors and embalmers may earn promotion to higher paying positions such as personnel manager or general manager. Some workers eventually acquire enough money and experience to establish their own businesses.

Employment Outlook

Little change in the employment of funeral directors and embalmers is expected through the mid-1980's. In recent years, the number of mortuary school graduates has approximately equaled the number of jobs available due to retirements, deaths, and transfers to other occupations. Barring any significant growth in enrollments, future graduates should find employment opportunities available.

Demand for funeral services will rise as the population grows and deaths increase. Most funeral homes, however, will be able to meet the demand without expanding their employment. The average funeral home conducts only one or two funerals each week and is capable of handling several more without hiring additional employees.

Earnings and Working Conditions

In 1974, funeral directors and embalmers generally earned from $200 to $300 a week. Managers generally earned between $10,000 and $15,000 a year, and many owners earned more than $20,000. Apprentices earned between $2.25 and $4 an hour.

In large funeral homes, employees usually have a regular work schedule. Typically they put in 8 hours a day, 5 or 6 days a week. Overtime, however, occasionally may be necessary. Some employees work shifts; for example, nights 1 week, and days the next.

Occasionally embalmers may come into contact with contagious diseases but the possibility of their becoming ill is remote, even less likely than for a doctor or nurse.

Sources of Additional Information

Information about job opportunities in this field is available from local funeral homes and from:

National Funeral Directors Association of the United States, Inc., 135 W. Wells St., Milwaukee, Wisc. 53203.

National Selected Morticians, 1616 Central St., Evanston, Ill. 60201.

For a list of accredited schools of mortuary science and information about scholarship opportunities, contact:

The American Board of Funeral Service Education, Inc., 201 Columbia St., Fairmont, W. Va. 26554.

PRIVATE HOUSEHOLD SERVICE OCCUPATIONS

About 1.4 million workers were employed in private households in 1974. The majority were domestic workers who performed household tasks such as cooking, cleaning, or caring for children, but workers in other occupations also are employed by private households. Gardeners keep the grounds of large estates looking attractive by planting shrubs and flowers and cutting the lawn. Chauffeurs drive their employers' cars and keep the vehicles clean and in good running condition. Some households employ private nurses and secretaries.

Most private household workers work for several different employers at once, spending a day or two a week with each one. Others work for only one employer, and in some cases live in their employer's house.

The following statement discusses some of the most important domestic occupations found in private households, including general housekeeper, companion, and child monitor. For information on the services that nurses and secretaries may perform in private households, see the statements on these occupations elsewhere in the *Handbook*.

PRIVATE HOUSEHOLD WORKERS

(D.O.T. 099.228, 301.887, 303.138 and .878; 304.887, 305.281, 306.878, 307.878, and 309.138 through .999)

Nature of the Work

Thousands of people employ private household workers to help care for children, clean and maintain the house and yard, cook meals, or serve the family. Some household workers specialize in one of these jobs, but the duties of most workers change from day to day. Frequently, workers who specialize live in their employer's house.

Most private household workers are employed as *general houseworkers* or *mother's helpers*. These workers clean the house and may also be responsible for meal preparation, laundry, or caring for children. When hired by the day or hour, they are called *day workers*.

Heavy household tasks and yard maintenance are usually performed by *caretakers*. They may wash windows, paint fences and mow the lawn.

In some households meals are prepared by *cooks*. Some cooks do everything from planning menus and buying food to serving meals and cleaning the kitchen. Others follow the instructions of a family member. Cooks may be assisted by a *cook's helper*, who is less skilled than a cook and performs simple tasks, such as peeling vegetables and cleaning the kitchen.

A few households employ *launderers* to wash, iron, and fold the laundry.

Some private household workers specialize in performing personal services for members of the family. *Lady's and gentleman's attendants* serve their employers by keeping their clothes pressed and hung, making their beds, helping them dress, and running errands. *Companions* do similar work, but they also act as a friend or aide to the convalescent, elderly, or handicapped person who employs them.

An area many private household workers specialize in is child care. *Child monitors* bathe children, prepare their meals, launder their clothes, and supervise their play. Those who care for very young children are responsible for sterilizing bottles, preparing formulas, and changing diapers. A *Child mentor*, or tutor,usually has charge of school-age children and supervises their recreation, diet, and health, as well as their education. These workers also are responsible for disciplining the children and arranging their activities. Sometimes they teach art, music, or languages.

A household with a large staff of workers may employ a *home housekeeper* or a *butler* to supervise the staff and the operation of the household. These workers usually are responsible for hiring and firing the other household employees. In addition to these duties, butlers receive and announce guests, answer telephones, serve food and drinks, and may act as gentleman's attendants. Housekeepers order

Cooks employed in private households may be responsible for planning menus and buying food, as well as preparing and serving meals.

food and cleaning supplies and keep a record of expenditures.

Places of Employment

More than 1.2 million persons—about 98 percent of them women—were employed as private household workers in 1974. Nearly all worked in their employers' homes, but a few specialized workers, such as laundresses and child monitors, worked at their own homes.

Most private household workers are employed part time, working half-days or only 2 or 3 days a week. Those who live in their employer's house work longer hours. Household jobs can be found throughout the country, but most are located in urban areas and in the South.

Training, Other Qualifications, and Advancement

For most household jobs, formal education is much less important than experience and an ability to cook, clean, or care for a yard. Employers prefer workers who know how to operate vacuum cleaners, floor waxers, and lawn mowers, but most young people can learn these skills while helping with the house and yard work at home. Some household workers acquire skills by spending a year working as a mother's helper under the supervision of either an experienced household worker or their employer.

Home economics courses in high schools, vocational schools, and junior colleges offer training in child development and meal preparation that can be very useful to persons interested in becoming cooks or child care workers. Training programs sponsored by Federal agencies, State employment service offices, and local welfare departments also teach many of the skills needed for household work.

For a person wishing a job as a child mentor or a companion, educational and cultural background is more important than work experience. Generally a companion's background, interests, and age should be similar to his or her employer's, and practical nursing experience is useful if the employer is an invalid. Being able to read well or carry on an interesting conversation also is helpful. A well-rounded education, including art and music, and teaching skills are important to a child mentor, especially one who is responsible for younger children.

Private household workers must have physical stamina because they are on their feet most of the time and sometimes must do some heavy lifting. The desire to do a job carefully and thoroughly is important. Household workers should be able both to get along well with people and to work independently. Some workers, particularly cooks and infant's nurses, need a health certificate showing that they are free of contagious diseases. Many employers arrange and pay for the necessary physical examination.

Advancement other than an increase in wages generally is not possible in private household work. Few households require live-in workers and even fewer require so many that a butler or home housekeeper is needed as a supervisor. Workers can transfer to better paying and more highly skilled household jobs, such as cook, lady's or gentleman's attendant, or child monitor; but job openings in these occupations are limited. Private household workers who are trained and experienced in child care, however, may obtain jobs in child or day care facilities. Cooks may obtain jobs in cafeterias or restaurants.

Employment Outlook

Although the number of private household workers is expected to decline through the mid-1980's, thousands of openings will result each year from the need to replace those who die, retire, or leave the occupation. The demand for household workers has exceeded supply for some time, as more women, especially those with young children, enter the labor force. Low wages, the tedious nature of some household tasks, and the lack of advancement opportunities discourage many persons from entering the occupation, however, and some prospective employers are turning to child-care centers and commercial cleaning services for help.

Opportunities for domestic workers, particularly general housekeepers and child monitors, will be good through the mid-1980's. Many openings will be available for part-time work.

Earnings and Working Conditions

In 1974, full-time female private household workers averaged $2,243 a year, less than half the average for all nonsupervisory workers in private industry, except farming. Earnings data are unavailable for men in the occupation because they represent such a small proportion of total employment. The provisions of Federal and State minimum wage laws were extended to private household workers in May 1974.

Wages vary according to the work performed, employer's income, and the custom of the local area. Earnings are highest in large cities, especially in the North. workers who "live in" generally earn more than those who must travel to their jobs, but the latter often receive transportation money and a free meal.

Most private household workers receive instructions from their employers, but are free to work on their own. Frequently, they have a key to the house or apartment. Household work is often tedious, especially for day workers who generally are given the less desira-

ble tasks, such as cleaning bathrooms or kitchen cupboards. Long or irregular working hours can isolate workers who "live in" from their families and friends, and if they are the sole employees in the households, they are likely to be alone most of the time.

Sources of Additional Information

Facts about employment opportunities and training programs in private household work are available from local offices of State employment services.

Information on laws affecting household workers and guidelines for work is available from:

National Committee on Household Employment, 7705 Georgia Ave., NW, Suite 208, Washington, D.C. 20012.

PROTECTIVE AND RELATED SERVICE OCCUPATIONS

The growth of our Nation's population and economy has put an increasing emphasis on protective services. Each city, suburban area, and national port of entry requires protective and related service workers to check crime, minimize loss of life and property, and enforce regulations that protect the health and safety of our citizens at home and on the job.

Careers in protective and related service occupations require varied combinations of education and experience. Workers such as FBI special agents and some Federal Government inspectors must have at least a bachelor's degree, while guards may have less than a high school education. Most occupations in this group, however, require a high school diploma. In many cases, a college degree is an asset for advancement to higher level positions.

In addition to educational requirements, most workers in protective and related services must undergo formal training programs and get on-the-job experience before they are fully qualified. Training programs last from several days to a few months and emphasize specific job-related skills.

Personal qualifications such as honesty and an understanding of human nature are important. Persons seeking careers in protective and related service occupations should sincerely desire to serve the community and be able to exercise proper judgment under a variety of conditions.

This section describes the work of several occupations in protective and related services: FBI Special Agents, Firefighters, Police Officers, State Police Officers, Guards, Occupational Safety and Health Workers, and Health, Regulatory, and Construction Inspectors.

FBI SPECIAL AGENTS

(D.O.T. 375.168)

Nature of the Work

Federal Bureau of Investigation (FBI) Special Agents investigate violations of Federal laws such as bank robberies, kidnappings, frauds against the Government, thefts of Government property, espionage, and sabotage. The FBI, which is part of the U.S. Department of Justice, has jurisdiction over many different Federal investigative matters. Special Agents, therefore, may be assigned to any type of case, although those with specialized training usually work on cases related to their background. Agents with an accounting background, for example, may investigate bank embezzlements or fraudulent bankruptcies.

Because the FBI is a fact-gathering agency, its Special Agents function strictly as investigators, collecting evidence in cases in which the United States is or may be an interested party. (The FBI does not give personal protection to individuals or do police work to insure that the law is obeyed. Such matters are handled by local and State law enforcement agencies.) In their casework, Special Agents may interview people, observe the activities of suspects, and participate in raids. Because the FBI's work is highly confidential, Special Agents may not disclose any of the information gathered in the course of their official duties to unauthorized persons, including members of their families. At times, agents have to testify in court about cases which they investigate.

Although they work alone on most assignments, agents communicate with their supervisors by radio or telephone as the circumstances dictate. In performing potentially dangerous duties, such as arrests and raids, two or more agents are assigned to work together.

Places of Employment

About 8,600 persons were Special Agents in 1974. The FBI has been accepting applications from women since 1972, and 30 women now work as Special Agents.

Most agents were assigned to the FBI's 59 field offices located throughout the Nation and in Puerto Rico. They worked in cities where field office headquarters are located or in resident agencies (suboffices) established under field office supervision to provide prompt and efficient handling of investigative matters arising throughout the field office territory. Some agents are assigned to the Bureau headquarters in Washington, D.C., which supervises all FBI activities.

Training, Other Qualifications, and Advancement

To be considered for appointment as an FBI Special Agent, an applicant usually must be a graduate of a State-accredited law school or a college graduate with a major in accounting. The law school training must have been preceded by at least 2 years of undergraduate col-

FBI special agent photographs a weapon.

lege work. Accounting graduates must have at least 1 year of experience in accounting, auditing, or a combination of both.

From time to time, as the need arises, the FBI accepts applications from persons who have a 4-year college degree with a physical science major or fluency in a foreign language, and also from persons who have 3 years of professional, executive, complex investigative, or other specialized experience.

Applicants for the position of FBI Special Agent must be citizens of the United States, at least 23 and not more than 35 years old, and willing to serve anywhere in the United States or Puerto Rico. They must be capable of strenuous physical exertion, and have excellent hearing and vision, normal color perception, and no physical defects which would prevent their using firearms or participating in dangerous assignments. All applicants must pass a rigid physical examination, as well as written and oral examinations testing their knowledge of law or accounting and their aptitude for meeting the public and conducting investigations. All of the tests except the physical examinations are given by the FBI at its facilities. Background and character investigations are made of all applicants. Appointments are made on a probationary basis and become permanent after 1 year of satisfactory service.

Each newly appointed Special Agent is given about 14 weeks of training at the FBI Academy at the U.S. Marine Corps Base in Quantico, Va. before assignment to a field office. During this period, agents receive intensive training in defensive tactics and the use of firearms. In addition, they are thoroughly schooled in Federal criminal law and procedures, FBI rules and regulations, fingerprinting, and investigative work. After assignment to a field office, the new agent usually works closely with an experienced agent for about 2 weeks before handling any assignments independently.

All administrative and supervisory jobs are filled from within the ranks by selecting those FBI Special Agents who have demonstrated the ability to assume more responsibility.

Employment Outlook

The jurisdiction of the FBI has expanded greatly over the years. Although it is impossible to forecast Special Agent personnel requirements, employment may be expected to increase with growing FBI responsibilities.

The FBI provides a career service and its rate of turnover is traditionally low. Nevertheless, the FBI is always interested in applications from qualified persons who would like to be considered for the position of Special Agent.

Earnings and Working Conditions

The entrance salary for FBI Special Agents was $13,379 in late 1974. Special Agents are not appointed under Federal Civil Service regulations, but, like other Federal employees, they receive periodic within-grade salary raises if their work performance is satisfactory; they can advance in grade as they gain experience.

Special Agents are subject to call 24 hours a day and must be available for assignment at all times. Their duties call for some travel, for

they are assigned wherever they are needed in the United States or Puerto Rico. They frequently work longer than the customary 40-hour week and, under specified conditions, receive overtime pay up to about $3,350 a year. They are granted paid vacations, sick leave, and annuities on retirement.

Sources of Additional Information

The Federal Bureau of Investigation, U.S. Department of Justice, Washington, D.C. 20535.

FIREFIGHTERS

(D.O.T. 373.118 through .884)

Nature of the Work

Every year fires destroy thousands of lives and property worth millions of dollars. Firefighters help protect the public against this danger. This statement gives information only about paid professional firefighters; it does not cover the many thousands of volunteer firefighters in local communities across the country.

During duty hours, firefighters must be prepared to rush to a fire and handle any emergency that arises. Because firefighting is dangerous and complicated, it requires organization and teamwork. At every fire, firefighters perform specific duties assigned by their commanding officer: they may connect hose lines to hydrants, operate a pressure pump, or position ladders. Because their duties may change several times while the company is in action they must be skilled in many different firefighting activities. In addition, they help people to safety and administer first aid.

Fire departments also are responsible for fire prevention. Many departments provide specially trained personnel to inspect public buildings for conditions that might cause a fire. They may check the number and working condition of fire escapes and fire doors, the storage of flammable materials, and other possible hazards. In addition, firefighters educate the public about fire prevention and safety measures. They frequently speak on this subject before school assemblies and civic groups, and, in some communities, they inspect private homes for fire hazards.

Between alarms, firefighters spend much time improving their skills and doing maintenance work. They also have practice drills, clean and lubricate equipment, and stretch hoses to dry.

Places of Employment

Nearly 220,000 persons, including a small number of women, worked as firefighters in 1974. Nine out of ten worked in municipal fire departments. Some very large cities have several thousand firefighters on the payroll while many small towns have fewer than 25. Some firefighters work in fire departments on State and Federal installations and others work in large manufacturing plants.

Training, Other Qualifications, and Advancement

Applicants for municipal firefighting jobs must pass a written intelligence test, a medical examination, and tests of strength, physical stamina, and agility, as specified by local civil service regulations. These examinations are open to men and women who are at least 18 years of age, meet certain

height and weight requirements, and have a high school education. Those who receive the highest scores on the examinations have the best chances for appointment. Extra credit usually is given for military service, and experience gained as a volunteer firefighter or through training in the Armed Forces also may improve an applicant's chances for appointment.

As a rule, beginners in large fire departments are trained for several weeks at the city's fire school. Through classroom instruction and practice drills, the recruits study firefighting techniques, fire prevention, local building codes, and first aid; also, they learn how to use axes, chemical extinguishers, ladders, and other equipment. After completing this training, they are assigned to local fire companies.

Experienced firefighters often continue study to improve their job performance and prepare for promotional examinations. Fire departments frequently conduct training programs, and many colleges and universities offer courses such as fire engineering and fire science that are helpful to firefighters.

Among the personal qualities firefighters need are mental alertness, courage, mechanical aptitude, endurance, and a sense of public service. Initiative and good judgment are extremely important because firefighters often must make quick decisions in emergency situations. Because members of a crew eat, sleep, and work closely together under conditions of stress and danger, they should be dependable and able to get along well with others in a group. Leadership qualities are assets for officers who must establish and maintain a high degree of discipline and efficiency as well as direct the activities of the firefighters in their companies.

Opportunities for promotion are good in most fire departments. As firefighters gain experience, they may advance to higher ratings. After 3 to 5 years of service they may become eligible for promotion to the grade of lieutenant. The line of further promotion usually is to captain, then battalion chief, assistant chief, deputy chief, and finally to chief. Chances for advancement generally depend upon each candidate's position on the promotion list, as determined by the score on a written examination, his or her supervisor's rating, and seniority.

Employment Outlook

Employment of firefighters is expected to increase about as fast as the average for all occupations through the mid-1980's to meet the growing need for fire protection. Several thousand jobs will become available each year due to growth and the need to replace those who die, retire, or leave the occupation.

Employment should rise as new fire departments are formed and as others enlarge their fire prevention sections. Much of the expected increase will occur in smaller communities as volunteer fire companies are replaced by professional fire departments. Additional firefighters also may be required as more and more cities shorten the workweek for firefighters and other municipal employees.

The number of firefighters in a community ultimately depends upon the availability of funds from the municipal government for salaries and equipment. Fire protection is an essential service and citizens are likely to exert considerable pressure on city officials to expand fire protection coverage. However, local governments must live within their budgets. This means that in some financially troubled cities, firefighter employment probably will remain at current levels or decline while in other cities, employment is likely to increase substantially to meet the needs of an expanding population.

The number of young people who qualify for firefighter jobs in large cities usually is greater than the number of job openings, even though the written examination and physical requirements eliminate many applicants. Therefore, competition among candidates in urban areas is apt to remain keen. Opportunities should be much better in smaller communities.

Earnings and Working Conditions

In 1974, average entrance salaries for beginning full-time firefighters ranged from $9,200 to $11,000 a year, depending on city size and region of the country. Average maximum salaries also varied—$10,100 in towns with a population less than 25,000, $11,900 in cities of 50,000 to 100,000 persons, and $12,800 in those over 500,000 in population. Earnings for firefighters are lowest in the South and highest in the West, and generally are higher in suburban districts than in large cities. Average earnings of all firefighters are about one and one-half times as much as the average of all nonsupervisory workers in private industry, except farming.

Fire chiefs in cities of 100,000 or more averaged $25,800 a year in 1974. Those who headed fire departments in cities with populations of more than 1 million earned $39,000.

Practically all fire departments furnish allowances to pay for protective clothing (helmets, boots, and rubber coats) and many also provide dress uniforms.

In some cities, firefighters are on duty for 24 hours, then off for 24 hours, and receive an extra day off at intervals. In other cities, they work a day shift of 10 hours or a night shift of 14; shifts are rotated at frequent intervals. The average workweek for firefighters is 52 hours, but duty hours usually include some time when they are free to read, study, or pursue other personal interests. In addition to

scheduled hours, firefighters often must work extra hours when they are bringing a fire under control. When overtime is worked, most fire departments give compensatory time off or extra pay.

The job of a firefighter involves risk of death or injury from sudden cave-ins of floors or toppling walls and danger from exposure to flames and smoke. Firefighters also may come in contact with poisonous, flammable, and explosive gases and chemicals. In addition, they frequently work in bad weather.

Firefighters generally are covered by liberal pension plans that often provide retirement at half pay at age 50 after 25 years of service or at any age if disabled in the line of duty. Firefighters also receive paid vacations. Provisions for sick leave usually are liberal. Health and surgical benefit plans are offered in many fire departments and compensation is provided for firefighters injured in the line of duty. Most fire departments provide paid holidays—ranging to 11 or more a year—or compensatory time off for working on holidays.

About 8 out of 10 firefighters are members of the International Association of Firefighters (AFL-CIO).

Sources of Additional Information

Information on obtaining a job as a firefighter is available from local civil service commission offices or fire departments.

Information about a career as a firefighter or specific job duties may be obtained from:

International Association of Fire Fighters, 1750 New York Ave. NW., Washington, D.C. 20006.

International Association of Fire Chiefs, 1725 K St. NW., Washington, D.C. 10006.

Additional information on the salaries and hours of work of firefighters in various cities is published annually by the International City Management Association in its *Municipal Yearbook*, which is available in many libraries.

GUARDS

(D.O.T. 372.868)

Nature of the Work

Guards patrol and inspect property to protect it against fire, theft, vandalism, and illegal entry. The specific duties of these workers, however, vary by size, type, and location of employer.

In office buildings, banks, hospitals, and department stores, guards protect records, merchandise, money, and equipment. In department stores they often work with undercover detectives watching for theft by customers or store employees.

At ports and railroads, guards protect merchandise in shipment as well as property and equipment. They insure that nothing is stolen while being loaded or unloaded, and watch for fires, prowlers, and trouble among work crews. Sometimes they direct traffic.

Guards who work in public buildings, such as museums or art galleries, protect paintings or exhibits from fire, theft, or damage.

They also answer routine questions from visitors and sometimes guide traffic.

In large factories, aircraft plants, and defense installations where valuable information must be protected, some guards check the credentials of persons and vehicles entering and leaving the premises. University, park, or recreation guards perform similar duties and also may issue parking permits and direct traffic.

At social affairs, sports events, conventions, and other public gatherings, guards maintain order, give information, and watch for suspicious persons.

In a large organization, a security officer often is in charge of the guard force; in a small organization a single worker may be responsible for security. Patrolling usually is done on foot; but if the property is large, guards may make their rounds by car or motor scooter.

As they make their rounds, guards check all doors and windows, see that no unauthorized persons remain after working hours, and insure that fire extinguishers, alarms, sprinkler systems, furnaces, and various electrical and plumbing systems are working properly. They sometimes set thermostats or turn on machines for janitorial workers.

Guards usually are uniformed and often carry a nightstick or gun. They also may carry a flashlight, whistle, two-way radio, and a watch clock—a device that indicates the time at which they reach various checkpoints.

Places of Employment

In 1974, almost 475,000 persons—over 95 percent of them men—worked as guards. Most work in office buildings, defense installations and other government buildings, stores, hotels, banks, and schools. Large numbers also work in manufacturing industries.

Although guard jobs are found throughout the country, most are

located in highly industrialized areas.

Training, Other Qualifications, and Advancement

Most employers prefer guards who are high school graduates. Applicants with less than a high school education usually are tested for their reading and writing abilities and their competence in following written and oral instructions. Employers also seek people who have had experience in the military police or in State and local police departments.

Candidates for guard jobs in the Federal Government must be veterans, have some experience as guards, and pass a written examination. For most Federal guard positions, applicants must qualify in the use of firearms. A driver's permit is required for some jobs.

Many employers give newly hired guards instruction before they start the job and also provide several weeks of on-the-job training. Guards may be taught the use of firearms, the administration of first aid, how to handle various emergencies, and ways to spot and deal with security problems.

Applicants are expected to have good character references, no police record, good health—especially in hearing and vision—and good personal habits such as neatness and dependability. They should be mentally alert, emotionally stable, and physically fit to cope with emergencies. Some employers require guards to meet height and weight specifications or to be within a certain age range.

Although guards in small companies receive periodic salary increases, advancement is likely to be limited. However, most large organizations use a military type of ranking that offers advancement in position and salary. Guards with some college education may advance to jobs that involve administrative duties or the prevention of espionage and sabotage.

Employment Outlook

Employment of guards is expected to grow more slowly than the average for all occupations through the mid-1980's. Most openings will arise as guards retire, die, or leave their jobs for other reasons. Replacement needs in this occupation are relatively high because guards are somewhat older, on the average, than workers in most occupations. Opportunities will be most plentiful for persons seeking work on night shifts.

An increase in crime and vandalism will heighten the need for security in and around plants, stores, and recreation areas. Additional guards will be needed to provide better security, but an increased use of remote cameras, alarm systems, and other electronic surveillance equipment is expected to limit employment growth.

Earnings and Working Conditions

Guards averaged $2.71 an hour in 1974, according to a Bureau of Labor Statistics survey of urban areas. Those working in the North earned more than the average while guards employed in the South earned somewhat less. Guards earn about four-fifths as much as the average for all nonsupervisory workers in private industry, except farming.

Depending on their experience, newly hired guards in the Federal Government earned between $130 and $146 a week. Top supervisory guards in the Federal Government may be paid up to $247 a week. These workers usually receive overtime pay as well as a wage differential for the second and third shifts. Guards generally have paid vacations, sick leave, and insurance and pension plans.

About two-thirds of all guards work at night; the usual shift lasts 8 hours. Some employers have three shifts where guards rotate to divide daytime, weekend, and holiday work equally. Guards usually eat on the job instead of taking a regular lunch break.

Guards often work alone, so that no one is nearby to help if an accident or injury occurs. Some large firms therefore use a reporting service that enables guards to be in constant contact with a central station outside the plant. If they fail to transmit an expected signal, the central station investigates.

Sources of Additional Information

Further information about work opportunities for guards is available from local employers and the nearest State employment service office.

POLICE OFFICERS

(D.O.T. 375.118 through .868 and 377.868)

Nature of the Work

The security of our Nation's cities and towns greatly depends on the work of local police officers whose jobs range from controlling traffic to preventing and investigating crimes. Whether on or off duty, these officers are expected to exercise their authority whenever necessary.

Police officers who work in a small community have many duties. In the course of a day's work, they may direct traffic at the scene of a fire, investigate a housebreaking, and give first aid to an accident victim. In a large police department, by contrast, officers usually are assigned to a specific type of duty. Most officers are detailed either to patrol or traffic duty; smaller numbers are assigned to special work such as accident prevention or operation of communications systems. Others work as detectives (plain-clothes officers) assigned to

criminal investigation; still others, as experts in chemical and microscopic analysis, firearms identification, and handwriting and fingerprint identification. In very large cities, a few officers may work with special units such as mounted and motorcycle police, harbor patrols, helicopter patrols, canine corps, mobile rescue teams, and youth aid services.

Most newly recruited police officers begin on patrol duty. Recruits may be assigned to such varied areas as congested business districts or outlying residential areas. They may cover their beats alone or with other officers, and they may ride in a police vehicle or walk on "foot" patrol. In any case, they become thoroughly familiar with conditions throughout their area and, while on patrol, remain alert for anything unusual. They note suspicious circumstances, such as open windows or lights in vacant buildings, as well as hazards to public safety such as burned-out street lights or fallen trees. Officers also watch for stolen automobiles and enforce traffic regulations. At regular intervals, they report to police headquarters through call boxes, by radio, or by walkie-talkie. They prepare reports about their activities and may be called on to testify in court when cases result in legal action.

Places of Employment

About 480,000 full-time officers worked for local police departments in 1974. Although most were men, an increasing number of women are employed in police work.

Some cities have very large police forces. For example, New York has over 30,000 police officers and Chicago over 13,000. Hundreds of small communities employ fewer than 25 each. Women police officers work mainly in large cities.

Training, Other Qualifications, and Advancement

Local civil service regulations govern the appointment of police officers in practically all large cities and in many small ones. Candidates must be U.S. citizens, usually at least 21 years of age, and must meet certain height and weight standards. Eligibility for appointment depends on performance in competitive examinations as well as on education and experience. The physical examinations often include tests of strength and agility.

Because personal characteristics such as honesty, good judgment, and a sense of responsibility are especially important in police work, candidates are interviewed by a senior officer at police headquarters, and their character traits and background are investigated. In some police departments, candidates also may be interviewed by a psychiatrist or a pyschologist, or be given a personality test. Although police officers work independently, they must perform their duties in line with laws and departmental rules. They should enjoy working with people, and should want to serve the public.

In large police departments, where most jobs are found, applicants usually must have a high school education. A few cities require some college training and some hire law enforcement students as police interns. A few police departments accept applicants who have less than a high school education as recruits, particularly if they have worked in a field related to law enforcement.

More and more, police departments are encouraging applicants to take post-high school training in sociology and psychology. As a

result, more than 500 junior colleges, colleges, and universities now offer programs in law enforcement. Other courses helpful in preparing for a police career include English, American history, civics and government, business law, and physics. Physical education and sports are especially helpful in developing the stamina and agility needed for police work.

Young persons who have completed high school can enter police work in some large cities as police cadets, or trainees, while still in their teens. As paid civilian employees of the police department, they attend classes to learn police skills and do clerical work. They may be appointed to the regular force at age 21 if they have all the necessary qualifications.

Before their first assignments, officers usually go through a period of training. In small communities, recruits learn by working for a short time with experienced officers. Training provided in large city police departments is more formal and may last several weeks or a few months. This training includes classroom instruction in constitutional law and civil rights; in State laws and local ordinances; and in accident investigation, patrol, and traffic control. Recruits learn how to use a gun, defend themselves from attack, administer first aid, and deal with emergencies.

Police officers usually become eligible for promotion after a specified length of service. In a large department, promotion may allow an officer to specialize in one type of police work such as laboratory work, traffic control, communications, or work with juveniles. Promotions to the rank of sergeant, lieutenant, and captain usually are made according to a candidate's position on a promotion list, as determined by scores on a written examination and on-the-job performance.

Many types of training help police officers improve their performance on the job and prepare for advancement. Through training given at police department academies and colleges, officers keep abreast of crowd-control techniques, civil defense, legal developments that affect their work, and advances in law enforcement equipment. Many police departments encourage officers to work toward college degrees, and some pay all or part of the tuition.

Employment Outlook

Police work is attractive to many. The job frequently is challenging and involves much responsibility. Furthermore, layoffs are rare. In periods of relatively high unemployment, the number of persons seeking police employment may be greater than the number of openings. However, the written examinations and strict physical requirements always eliminate many applicants. The outlook should be good for persons having some college training in law enforcement. Opportunities should also be available for women and minority applicants as many departments recruit these workers to make police departments more representative of the populations they serve.

Law enforcement is complex and requires an approach tailored to the particular problems of each city. The police department of a city with a large mobile population is likely to emphasize traffic control, preventive patrol, and cooperation with police agencies in the surrounding areas. In smaller cities, or those with well established communities and fewer employment and recreation centers, police work may be less specialized. In either case, however, the usual way of increasing police protection is to provide more officers for duty.

The number of officers employed will depend on the amount of money made available by local governments. Because of the essential nature of police work, it is likely that funding for law enforcement will have high priority and that the employment of city police officers will rise faster than the average for other occupations through the mid-1980's.

Earnings and Working Conditions

In 1974, entry level salaries for police officers varied widely from city to city. In some smaller communities, officers earned less than $600 a month, while some major cities offered over $1,000 a month to new employees. Most officers receive regular salary increases during the first few years of employment until they reach a set maximum for their rank. Maximum earnings ranged from about $800 to over $1,200 a month in 1974.

Promotion to a higher rank brings a higher basic salary. Sergeants, for example, started at a salary as high as $1,300 a month in 1974 and in the largest cities, lieutenants began at over $1,400 a month. In general, police officers are paid about one and one-half times as much as nonsupervisory workers in private industry, except farming.

Police departments usually provide officers with special allowances for uniforms and furnish revolvers, night sticks, handcuffs, and other required equipment.

The scheduled workweek for police officers usually is 40 hours. Because police protection must be provided around the clock, in all but the smallest communities some officers are on duty over weekends, on holidays, and at night. Police officers are subject to call any time their services are needed and may work overtime in emergencies. In some departments, overtime is paid at straight time or time and one-half; in others, officers may be given an equal amount of time off on another day of the week.

Police officers generally are covered by liberal pension plans,

enabling many to retire at half pay by the time they reach age 55. In addition, paid vacations, sick leave, and health and life insurance plans frequently are provided.

Police officers may have to work outdoors for long periods in all kinds of weather. The injury rate is higher than in many occupations and reflects the risks officers take in pursuing speeding motorists, capturing lawbreakers, and dealing with public disorder.

Sources of Additional Information

Information about entrance requirements may be obtained from local civil service commissions or police departments.

Additional information describing careers as police officers is available from:

International Association of Chiefs of Police, 11 Firstfield Rd., Gaithersburg, Md. 20760.

Fraternal Order of Police, National Headquarters, 3094 Bertha St., Flint, Mich. 48504.

STATE POLICE OFFICERS

(D.O.T. 375.118, .138, .168, .228, .268, and .388)

Nature of the Work

The laws and regulations that govern the use of our Nation's roadways are designed to insure the safety of all citizens. State police officers (sometimes called State troopers) patrol our highways and enforce these laws.

State police officers issue traffic tickets to motorists who violate the law. At the scene of an accident, they direct traffic, give first aid, call for emergency equipment including ambulances, and write reports to be used in determining the cause of the accident.

In addition, State police officers provide services to motorists on the highways. For example, they radio for road service for drivers in mechanical trouble, direct tourists to their destination, or give information about lodging, restaurants, and tourist attractions.

State police officers also provide traffic assistance and control during road repairs, fires, and other emergencies, as well as for special occurrences such as parades and sports events. They sometimes check the weight of commercial vehicles, conduct driver examinations, and give information on highway safety to the public.

In addition to highway responsibilities, State police may investigate crimes, particularly in areas that do not have a police force. They sometimes help city or county police catch lawbreakers and control civil disturbances. State highway patrols, however, normally are restricted to vehicle and traffic matters.

Some police officers work with special State police units such as the mounted police, canine corps, and marine patrols. Others instruct trainees in State police schools, pilot police aircraft, or specialize in fingerprint classification or chemical and microscopic analysis of criminal evidence.

State police officers also write reports and maintain police records. Some officers, including division or bureau chiefs responsible for training or investigation and those who command police operations in an assigned area, have administrative duties.

Places of Employment

About 45,500 State police officers were employed in 1974. Although almost all were men, positions for women are expected to increase in the future.

The size of State police forces varies considerably. The largest force (in California) has over 5,000 officers; the smallest (in North Dakota) has fewer than 100. One State (Hawaii) does not maintain a police force.

Training, Other Qualifications, and Advancement

State civil service regulations govern the appointment of State police officers. All candidates must be citizens of the United States. Other entry requirements vary, but most States require that applicants have a high school education or an equivalent combination of education and experience and be at least 21 years old.

Officers must pass a competitive examination and meet physical and personal qualifications. Physical requirements include standards of height, weight, and eyesight. Tests of strength and agility often are required. Because honesty and a sense of responsibility are important in police work, an applicant's character and background are investigated.

Although State police officers work independently, they must perform their duties in line with department rules. They should want to serve the public and be willing to work outdoors in all types of weather.

In all States, recruits enter a formal training program for several months. They receive classroom instruction in State laws and jurisdictions, and they study procedures for

accident investigation, patrol, and traffic control. Recruits learn to use guns, defend themselves from attack, handle an automobile at high speeds, and give first aid. After gaining experience, some officers take advanced training in police science, administration, law enforcement, or criminology. Classes are held at junior colleges, colleges and universities, or special police institutions such as the National Academy of the Federal Bureau of Investigation.

High school and college courses in English, government, psychology, sociology, American history, and physics help in preparing for a police career. Physical education and sports are useful for developing stamina and agility. Completion of a driver education course and training received in military police schools also are assets.

Police officer recruits serve a probationary period ranging from 6 months to 3 years. After a specified length of time, officers become eligible for promotion. Most States have merit promotion systems that require officers to pass a competitive examination to qualify for the next highest rank. Although the organization of police forces varies by State, the typical avenue of advancement is from private to corporal, to sergeant, to first sergeant, to lieutenant, and then to captain. Police officers who show administrative ability may be promoted to higher level jobs such as commissioner or director.

In some States, high school graduates may enter State police work as cadets. These paid civilian employees of the police organization attend classes to learn various aspects of police work and are assigned nonenforcement duties. Cadets who qualify may be appointed to the State police force at age 21.

Employment Outlook

State police employment is expected to grow much faster than the average for other occupations. Although most jobs will result from this growth, some openings will be created as officers retire, die, or leave the occupation for other reasons. As job openings are filled from the ranks of available applicants, the increased interest of women in police work will result in greater employment of women for patrol duties.

Although some State police will be needed in criminal investigation and other nonhighway functions, the greatest demand will be for officers to work in highway patrol. This is the result of a growing, more mobile population. In ever increasing numbers, Americans are using the motor vehicle as a source of recreation. Motorcycles, campers, and other recreational vehicles will continue to add to the Nation's traffic flow and require additional officers to insure the safety of highway users.

Because law enforcement work is becoming more complex, specialists will be needed in crime laboratories and electronic data processing centers to develop administrative and criminal information systems. However, in many departments, these jobs will be filled by civilian employees rather than uniformed officers.

Earnings and Working Conditions

In 1974, beginning salaries for State police officers ranged from almost $600 to about $1,000 a month. The most common entry rates ranged from $600 to $700 a month. Although starting salaries are normally higher in the West and lower in the South, State police officers on the average earn about 1 1/2 times as much as nonsupervisory workers in private industry, except farming.

State police generally receive regular increases, based on experience and performance, until a specified maximum is reached. In 1974, maximum rates ranged from about $750 to over $1,200 a month; maximum rates were most commonly between $900 and $1,000 a month. Earnings increase with promotions to higher ranks. The most common maximum salaries for State police sergeants in 1974 were between $1,000 and $1,200. Lieutenants earned more, often between $1,200 and $1,300 a month.

State police agencies usually provide officers with uniforms, firearms, and other necessary equipment, or give special allowances for their purchase.

In many States, the scheduled workweek for police officers is 40 hours. Although the workweek is longer in some States, hours over 40 are being reduced. Since police protection must be provided around the clock, some officers are on duty over weekends, on holidays, and at night. Police officers also are subject to emergency calls at any time.

State police usually are covered by liberal pension plans. Paid vacations, sick leave, and medical and life insurance plans frequently are provided.

The work of State police officers is sometimes dangerous. They always run the risk of an automobile accident while pursuing speeding motorists or fleeing criminals. Officers also face the risk of injury while apprehending criminals or controlling disorders.

Sources of Additional Information

Information about specific entrance requirements may be obtained from State civil service commissions or State police headquarters, usually located in each State capital.

CONSTRUCTION INSPECTORS (GOVERNMENT)

(D.O.T. 168.168)

Nature of the Work

Federal, State, and local government construction inspectors insure that recognized standards of safe construction and quality workmanship are observed in public and private construction. They inspect the construction, alteration, or repair of highways, streets, sewer and water systems, dams, bridges, buildings, and other structures to insure compliance with building codes and ordinances, zoning regulations, and contract specifications.

Construction inspectors visit worksites to inspect recently completed construction. On large projects, visits generally are required after each new stage of construction is completed. Members of large inspection staffs may be assigned to a single complex project. Inspectors prepare written reports and often keep a daily log of their work. Inspections are primarily visual in nature, although blueprints, tape measures, standard electrical metering devices, and other types of testing equipment frequently are used.

Construction inspectors notify the construction contractor, superintendent, or supervisor when they discover a detail of a project that is not in compliance with the appropriate codes, ordinances, or contract specifications. If the deficiency is not corrected within a reasonable period of time, they have authority to issue a "stop-work" order.

Many inspectors also investigate reported incidents of "bootlegging," construction or alteration that is being carried on without proper permits. Persons found in violation of permit laws are directed to obtain permits and submit to inspection.

Construction inspectors must keep abreast of new building code developments, since they advise representatives of the construction industry and the general public on matters of code interpretation, construction practices, and new technical developments. Senior inspectors usually coordinate the inspection of large projects and handle the most complex inspection assignments.

In addition to their field inspection duties, supervisory construction inspectors assign and coordinate the work of other inspectors and review reports submitted to them. They may review plans and specifications of proposed construction for compliance with codes, interpret codes and ordinances, and prepare construction progress reports. Supervisory building inspectors are often asked to assist in drawing up or revising local building codes and ordinances.

Construction inspectors generally specialize in one particular type of construction work. Broadly categorized, these are building, electrical, mechanical, and public works.

Building inspectors inspect the structural quality of buildings. Before construction, they determine whether the plans for the building or other structure comply with local zoning regulations and are suited to the engineering and environmental demands of the building site. They visit the worksite before the foundation is poured to inspect the positioning and depth of the footings. They inspect the foundation after it has been completed. The size and type of structure and the rate of completion determine the frequency and number of other visits they must make. Upon completion of the project, they conduct a final comprehensive inspection. Some building inspectors may specialize, for example, in structural steel or reinforced concrete.

Electrical inspectors inspect the installation of electrical systems and equipment to insure that they work properly and are in compliance with electrical codes and standards. They visit worksites to inspect new and existing wiring, lighting, sound and security systems, and generating equipment. They also may inspect the installation of the electrical wiring for heating and air-conditioning systems, kitchen appliances, and other components.

Mechanical inspectors examine plumbing systems including septic tanks, plumbing fixtures and traps, and water, sewer, and vent lines. They also inspect the installation of the mechanical components of kitchen appliances, heating and air-conditioning equipment, gasoline and butane tanks, gas piping, and gas-fired appliances. Some specialize in inspecting boilers, mechanical components, or plumbing.

Public works inspectors insure that Federal, State, and local government construction of water and sewer systems, highways, streets, bridges, and dams conforms to detailed contract specifications. They inspect excavation and fill operations, the placement of forms for concrete, concrete mixing and pouring, and asphalt paving. They also record the amount of work performed and materials used so that contract payment calculations can be made. Public works inspectors

may specialize in inspection of highways, reinforced concrete, or ditches.

Places of Employment

About 22,000 persons, nearly all of them men, worked as government construction inspectors in 1974. More than three-fourths worked for municipal or county building departments. Public works construction inspectors were employed primarily at the Federal and State level.

The employment of local government construction inspectors is concentrated in cities and in suburban areas undergoing rapid growth. These governments employ large inspection staffs, including most of the inspectors who specialize in structural steel, reinforced concrete, and boiler inspection.

About half the construction inspectors employed by the Federal Government work for the Department of Defense, primarily for the U.S. Army Corps of Engineers.

Training, Other Qualifications, and Advancement

To become a construction inspector, several years of experience as a construction contractor, supervisor, or craft worker are generally required. Federal, State, and most local governments also require an applicant to have a high school diploma. High school preparation should include courses in drafting, mathematics, and English.

Workers who want to become inspectors should have a thorough knowledge of construction materials and practices in either a general area like structural or heavy construction, or in a specialized area such as electrical or plumbing systems, reinforced concrete, or structural steel. Many employers prefer inspectors to be graduates of an apprenticeship program, to have studied at least 2 years toward an engineering or architectural degree, or to have a degree from a community or junior college, with courses in construction technology, blueprint reading, technical mathematics, English, and building inspection.

Construction inspectors must be in good physical condition in order to walk and climb about construction sites. They also must have a motor vehicle operator's license. In addition, Federal, State, and many local governments usually require that construction inspectors pass a civil service examination.

Construction inspectors receive most of their training on the job. During the first couple of weeks, working with an experienced inspector they learn about inspection techniques; codes, ordinances, and regulations; contract specifications; and recordkeeping and reporting duties. They begin by inspecting less complex types of construction such as residential buildings. The difficulty of their assignments is gradually increased until they are able to handle complex assignments. An engineering degree is frequently needed in order to advance to supervisory inspector.

The Federal Government and most State and large city governments conduct formal training programs for their construction inspectors to broaden their knowledge of construction materials, practices, and inspection techniques and to acquaint them with new materials and practices. Inspectors who work for small agencies which do not conduct training programs frequently can broaden their knowledge of construction and upgrade their skills by attending State-conducted training programs or by taking college or correspondence courses.

Employment Outlook

Employment of government construction inspectors is expected to grow faster than the average for all occupations through the mid-1980's. Because of the increasing complexity of construction technology and the trend toward the establishment of minimum professional standards for inspectors by State governments, job opportunities should be best for those who have some college education or knowledge of a specialized type of construction.

In addition to growth needs, job openings for construction inspectors will occur each year to replace those who die, retire, or transfer to other occupations.

The number of new positions for construction inspectors will be largely affected by the level of new housing and commercial building activity. Because construction activity is sensitive to ups and downs in the economy, the number of job openings may fluctuate from year to year.

The demand for construction inspectors also should increase as they are given more responsibility for insuring quality workmanship and safe construction of prefabricated building materials and other components that are mass-produced in factories and assembled on the construction site.

Earnings and Working Conditions

Starting salaries of construction inspectors working in cities and towns averaged about $10,500 a year in 1974, according to a survey conducted by the Public Personnel Association. Top salaries for senior inspectors averaged $13,000. Salaries for supervisory inspectors were higher in large cities. Among geographic regions, the western region of the United States tended to have the highest salaries, cities in the southern region the lowest.

In the Federal Government, construction inspectors started at $8,500 or $10,520 a year in late 1974, depending on the amount and nature of their earlier work experience. Journeyman construction inspectors were paid salaries rang-

ing from $12,841 to $17,497, and more experienced workers were paid salaries ranging from $15,481 to over $20,000.

Construction inspectors often spend a large portion of their time traveling between worksites. Usually, an automobile is furnished for their use or their expenses are reimbursed if they use their own. Since they spend most of their time outdoors or in partially enclosed structures, they are exposed to all types of inclement weather.

Unlike the seasonal and intermittent nature of employment in many of the occupations associated with the construction industry, inspection work tends to be steady and year-round.

Sources of Additional Information

Persons seeking additional information on a career as a State or local government construction inspector should contact their State or local employment service, or:

International Conference of Building Officials, 5360 South Workman Mill Rd., Whittier, Calif. 90601.

Persons interested in a career as a construction inspector with the Federal Government can get information from:

Interagency Board of the U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

HEALTH AND REGULATORY INSPECTORS (GOVERNMENT)

(D.O.T. 168.168, and .287)

Nature of the Work

Protecting the public from health and safety hazards, prohibiting unfair trade and employment practices, and raising revenue are included in the wide range of responsibilities of government. Health and regulatory inspectors help insure observance of the laws and regulations that govern these responsibilities. For discussion of a third, see the statement on Construction Inspectors (Government) elsewhere in the *Handbook*.

The duties, titles, and responsibilities of Federal, State, and local health and regulatory inspectors vary widely. Some types of inspectors work only for the Federal Government while others also are employed by State and local governments. Many other workers employed as accountants, agricultural cooperative extension service workers, and other agricultural professionals also have inspection duties.

Health Inspectors. Health inspectors work with engineers, chemists, microbiologists, and health workers to insure compliance with public health and safety regulations governing food, drugs, and various other consumer products. They also administer regulations that govern the quarantine of persons and products entering the United States from foreign countries. The major types of health inspectors are: food and drug, meat and poultry, agricultural quarantine inspectors, and sanitarians. In addition, some inspectors work in a field which is closely related to food inspection—agricultural commodity grading.

Most *food and drug inspectors* specialize in one area of inspection such as food, feeds and pesticides, weights and measures, or drugs and cosmetics. Some, especially those who work for the Federal Government, may be proficient in several of these areas. Working individually or in teams under the direction of a senior or supervisory inspector they travel throughout a geographical area to check periodically firms that produce, handle, store, and market food, drugs, and cosmetics. They look for evidence of inaccurate product labeling, decomposition, chemical or bacteriological contamination, and other factors that could result in a product becoming harmful to consumer health. They assemble evidence of violations, using portable scales, cameras, ultraviolet lights, container sampling devices, thermometers, chemical testing kits, and other types of equipment.

Product samples collected as part of their examinations are sent to laboratories for analysis. After completing their inspection, inspectors discuss their observations with the management of the plant and point out any areas where corrective measures are needed. They prepare written reports of their findings, and, when necessary, compile evidence that may be used in court if legal actions must be taken to effect compliance with the law.

Federal and State laws empower *meat and poultry inspectors* to inspect meat, poultry, and their byproducts to insure that they are wholesome and safe for public consumption. Working as part of a constant onsite team under the general supervision of a veterinarian, they inspect meat and poultry slaughtering, processing, and packaging operations. They also check to see that products are labeled correctly and that proper sanitation is maintained in slaughtering and processing operations.

Agricultural quarantine inspectors protect American agricultural

products from the introduction and spread of foreign plant pests and animal diseases. To safeguard the health of crops, forests, and gardens, they inspect ships, aircraft, railroad cars, and motor vehicles entering the United States for the presence of restricted or prohibited plant or animal materials.

Sanitarians, working primarily for State and local governments, perform a variety of inspection duties to help insure that the food people eat, the water they drink, and the air they breathe meet government standards. They check the cleanliness and safety of food and beverages produced in dairies and processing plants, or served in restaurants, hospitals, and other institutions. They often examine the handling, processing, and serving of food for compliance with sanitation rules and regulations.

Sanitarians concerned with waste control oversee the treatment and disposal of sewage, refuse, and garbage. They examine places where pollution is a danger, perform tests to detect pollutants, and collect air or water samples for analysis. Sanitarians determine the nature and cause of the pollution, then initiate action to stop it.

In large local and State health or agriculture departments, sanitarians may specialize in areas of work such as milk and dairy products, food sanitation, waste control, air pollution, institutional sanitation, and occupational health. In rural areas and small cities, they may be responsible for a wide range of environmental health activities.

Agricultural commodity graders apply quality standards to various commodities to insure that retailers and consumers receive good and reliable products. They generally specialize in an area such as egg products, processed or fresh fruits and vegetables, grain, or dairy products. They inspect samples of a particular product to determine its quality and grade, and issue official grading certificates. Graders also may inspect the plant and equipment to insure that adequate sanitation standards are maintained.

Regulatory Inspectors. Regulatory inspectors insure compliance with various laws and regulations that protect the public welfare. Important types of regulatory inspectors are: immigration; customs; aviation safety; mine, wage-hour compliance; alcohol, tobacco, and firearms; and occupational safety inspectors.

Immigration inspectors interview and examine people seeking admission, readmission, or the privileges of passing through or residing in the United States. They inspect the passports of those seeking to enter the United States to determine whether they are legally eligible to enter and to verify their citizenship, status, and identity. Immigration inspectors also prepare reports, maintain records, and process applications and petitions by aliens for privileges such as immigrating to or living temporarily in the United States.

Customs inspectors enforce the laws governing U.S. imports and exports. Stationed at airports, seaports, and border crossing points, they count, weigh, gauge, measure, and sample commercial cargoes entering and leaving the United States to determine the amount of tax that must be paid. They also inspect baggage and articles worn or carried by the passengers and crew of ships, aircraft, and motor vehicles to insure that all merchandise being brought through ports of entry is declared and the proper taxes paid.

Aviation safety officers insure that Federal Aviation Administration (FAA) regulations that govern the quality and safety of aircraft equipment and personnel are maintained. Aviation safety officers may inspect aircraft manufacturing, maintenance, or operations procedures. They usually specialize in inspecting either commercial or general aviation aircraft. They are responsible for the inspection of aircraft manufacturing and of major repairs. They also certify aircraft pilots and schools, pilot examiners, flight instructors, and instructional materials.

Mine inspectors work to enhance the health and safety of miners and to promote good mining practices. To insure compliance with safety laws and regulations, mine inspectors visit mines and related facilities to obtain information on health and safety conditions.

Mine inspectors discuss their findings with the management of the mine, prepare written reports that incorporate their findings and decisions, and issue notices of findings that describe violations and hazards that must be corrected. They also investigate and prepare reports on mine accidents and direct rescue and firefighting operations when fires or explosions occur.

Wage-hour compliance officers inspect the employer's time, payroll, and personnel records to insure compliance with the provisions of various Federal laws on minimum wages, overtime, pay, employment of minors, and equal employment opportunity. They often interview employees to verify the employer's records and to check for any complaints.

Alcohol, tobacco, and firearms inspectors insure that the industries which manufacture these products comply with the provisions of revenue laws and other regulations on operating procedures, unfair competition, and trade practices. They spend most of their time inspecting distilleries, wineries, and breweries; cigar and cigarette manufacturing plants; wholesale liquor dealers and importers; firearms and explosives manufacturers, dealers, and users; and other regulated facilities. They periodically audit these establishments to determine that appropriate taxes are correctly determined and paid.

Places of Employment

Over 110,000 people, 5 percent of them women, worked as health and regulatory inspectors in 1974. The largest single employer of food and drug inspectors is the U.S. Food and Drug Administration, but the majority work for State governments. Meat and poultry inspectors and commodity graders who work in processing plants are employed mainly by the U.S. Department of Agriculture. Agricultural quarantine inspectors work either for the U.S. Public Health Service or the U.S. Department of Agriculture. Sanitarians work primarily for State and local governments.

Regulatory inspectors work for various agencies within the Federal Government, mainly in regional and district offices distributed throughout the United States. For example, aviation safety officers work for the Federal Aviation Administration; wage-hour compliance officers, for the Department of Labor; mine inspectors, the Department of the Interior; and alcohol, tobacco, and firearms inspectors, the Treasury Department. Immigration, customs, and agricultural quarantine inspectors work at U.S. airports, seaports, border crossing points, and at foreign airports and seaports. They are employed by the Justice and Treasury Departments.

Training, Advancement, and Other Qualifications

Because inspectors perform such a wide range of duties, qualifications for employment in these positions vary greatly. The Federal Government requires a passing score on the Professional and Administrative Career Examination (PACE) for several inspector occupations, including immigration; customs; wage and hour compliance; alcohol, tobacco, and firearms; occupational safety; and consumer safety (food and drug). To take this examination, a bachelor's degree or 3 years of responsible work experience, or a combination of the two, are required. In some cases, agencies will give preference to an applicant whose course work or work experience is related to the field of employment.

Other Federal inspectors must pass an examination based on specialized knowledge, in addition to having work experience in related fields. These include commodity inspectors such as those in meat, poultry, livestock, and egg products.

Air safety inspectors must have considerable experience in aviation maintenance, and an FAA Air Frame and Power Plant certificate. In addition, various pilot certificates and considerable flight experience are required, with the type dependent on the inspection duties. Many air safety inspectors receive both their flight training and mechanical training in the Armed Forces. No written examination is required.

Applicants for mine safety inspector positions generally must have specialized work experience in mine management or supervision, or possess a skill such as electrical engineering (for mine electrical inspectors). In some cases, a general aptitude test may be required. Advancement to a supervisory position is competitive.

Some Civil Service registers including those for agricultural quarantine inspectors and fruit and vegetable graders, rate applicants solely on their experience and education and require no written examination.

Qualifications for inspectors at the State and local level are usually similar to those for Federal employees. However, this may vary among government employers, particularly at the local level.

All inspectors are trained in the laws and inspection procedures related to their specific field through a combination of classroom and on-the-job training. In general, people who want to become health and regulatory inspectors should be able to accept responsibility and like detailed work. They should be neat and personable and able to express themselves well orally and in writing.

All Federal Government inspectors are promoted on a Civil Service "career ladder." This means that, assuming satisfactory work performance, workers will advance automatically, usually at 1-year intervals, to a specified maximum level. Above this level (usually supervisory positions), advancement is competitive, based on needs of the agency and individual merit.

Employment Outlook

Employment of health and regulatory inspectors as a group is expected to increase faster than the average for all occupations through the mid-1980's. The growth in employment of health inspectors is expected to be more rapid than that of regulatory inspectors. In addition to job opportunities stemming from growth, many inspectors will be needed each year to replace those who die, retire, or transfer to other occupations.

Increased food consumption caused by population growth and greater public concern over potential health hazards, should create additional jobs for food and drug, meat and poultry, and other commodity inspectors and graders. Public concerns for improved quality and safety of consumer products also should result in new legislation in these areas, requiring additional inspectors to insure compliance.

Aviation industry growth, increased international travel, and increases in the volume of U.S. imports and exports should continue to create new openings for aviation safety officers, quarantine and immigration inspectors, and customs inspectors. Increasing coal mining

activity and concern over mine safety should create additional mine inspector jobs. Continued public pressure for equal employment rights should cause a growing need for wage-hour compliance officers.

Earnings and Working Conditions

With the exception of mine inspectors and aviation safety officers, the Federal Government paid health and regulatory inspectors and graders starting salaries of $8,500 or $10,520 a year in late 1974, depending on the type of position and the qualifications of the applicant. Aviation safety officers and mining inspectors usually received starting salaries of $12,841.

Salaries of experienced meat and poultry inspectors, egg product inspectors, agricultural quarantine inspectors, alcohol, tobacco, and firearms inspectors, and customs and immigration inspectors were almost $13,000 a year in late 1974. Experienced food and drug inspectors (consumer safety officers), agricultural quarantine inspectors, and wage-hour compliance officers usually received salaries of about $15,500 from the Federal Government in late 1974. Mine inspector and aviation safety officers earned between $18,500 and $22,000. Nonsupervisory sanitarians had average starting salaries of almost $10,000 in late 1974, according to a survey by the International Personnel Management Association in selected U.S. cities and counties. Those working for State governments earned about $1,000 less.

Most health and regulatory inspectors live an active life, meeting many people and working in a variety of environments. Many travel frequently and are usually furnished with an automobile or reimbursed for travel expenses.

At times inspectors must work under unfavorable working conditions. For example, meat and poultry, and alcohol, tobacco, and firearms inspectors frequently come in contact with strong, unpleasant odors; mine inspectors often spend a great deal of time in mines where they are exposed to the same hazards as miners. Many inspectors work long and often irregular hours.

Sources of Additional Information

For facts about inspector careers in the Federal Government, contact:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

More detailed information on qualifications for Federal jobs is available from local Civil Service Commission offices or from individual Federal agencies.

Information about career opportunities as inspectors in State and local governments is available from State civil service commissions, usually located in each State capital, or from local government offices.

OCCUPATIONAL SAFETY AND HEALTH WORKERS

(D.O.T. 010.081; 012.081 and .188; 079.188; 168.168, .268, and .284; 379.387; 821.387; and 909.128)

Nature of the Work

People in the occupational safety and health field have the challenging job of insuring a safe and healthful environment for workers and safe products for consumers. Safety and health workers in a number of different occupations strive to control occupational accidents and diseases, property losses, and injuries from unsafe products. This statement discusses both professional and paraprofessional occupations in private industry; for a discussion of related occupations in government, see the statement on Health and Regulatory Inspectors elsewhere in the *Handbook*.

The largest number of safety workers are *safety engineers*. Although all of them are concerned with preventing accidents, their specific tasks depend on where they work. For example, the safety engineer working in a large manufacturing plant (D.O.T. 012.081) may develop a comprehensive safety program covering several thousand employees. This usually entails detailed analysis of each job in the plant to identify potential hazards so that preventive measures can be taken. When accidents do occur, safety engineers in manufacturing plants investigate to determine the cause. If poor design, improper maintenance, or mechanical failure is involved, they use their technical skills to correct the situation and prevent its recurrence. When human error is the cause of an accident, safety engineers may establish training courses for plant workers and supervisors or reemphasize existing ones.

Safety engineers who work for trucking companies (D.O.T. 909.128) study schedules, routes, loads, and speeds to determine their influence on trucking accidents. They also inspect heavy rigs, such as trucks and trailers, to suggest ways of safer operation. In the mining industry, safety engineers (D.O.T. 010.081) may inspect underground or open-pit areas to insure compliance with State and Federal laws, design protective equipment and safety devices for mine machinery, or lead rescue activities during emergencies.

Many safety engineers are directly concerned with the safety of their company's product. They work closely with design engineers to develop models which meet all safety standards and they monitor

the manufacturing process to insure the safety of the finished product.

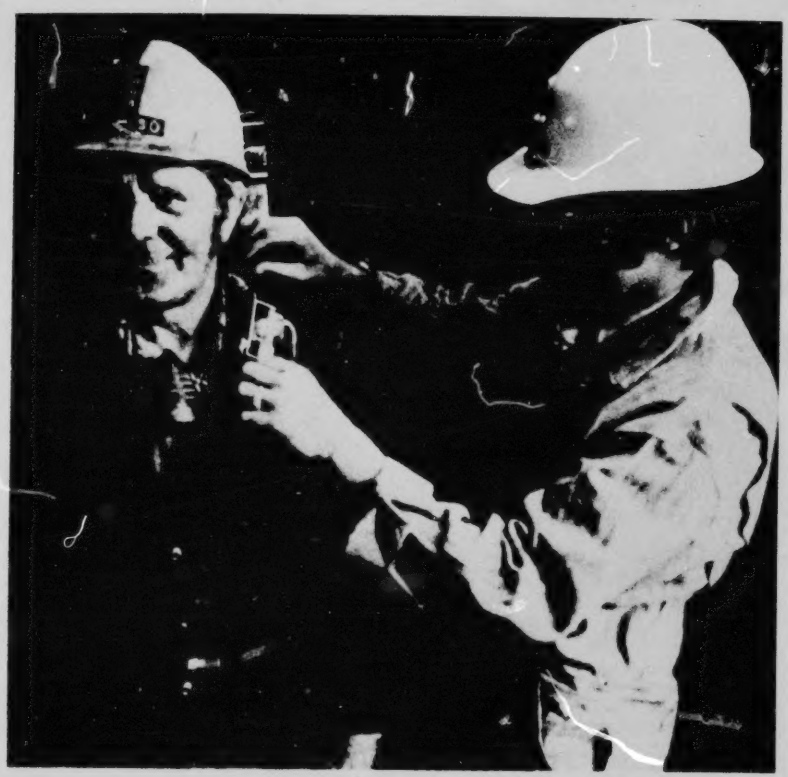
Safeguarding life and property against loss from fire, explosion, and related hazards is the job of the *fire protection engineer* (D.O.T. 012.188). Those who specialize in research investigate problems such as fires in high-rise buildings or the manufacture, handling, and storage of flammable materials. Fire protection engineers in the field use these research findings to identify hazards and devise ways to correct them. For example, new findings concerning flashpoints (the temperature at which different materials will ignite) are valuable to the engineer designing storage facilities in a chemical plant.

Like safety engineers, fire protection engineers may have different job duties depending on where they work. One who works for a fire equipment manufacturing company may design new fire protection devices, while engineers in consulting firms work with architects and others to insure that fire safety is built into new structures. In contrast, fire protection engineers working for insurance rating bureaus (organizations that calculate basic costs of insurance coverage in particular areas) inspect private, commercial, and industrial properties to evaluate the adequacy of fire protection for the entire area. Many fire protection engineers have special expertise in one area or more of fire protection, such as sprinkler or fire detection systems.

Losses in the workplace cannot be reduced without measures to eliminate hazards to workers' health. Designing and maintaining a healthful work environment is the job of the *industrial hygienist* (D.O.T. 079.188). These health professionals are concerned with how noise, dust, vapors, and other hazards common to the industrial setting affect workers' health. After a problem is detected, perhaps by analyzing employee medical records, the industrial hygienist at the jobsite may take air samples, monitor noise levels, or measure radioactivity levels in the areas under investigation.

Other industrial hygienists work in private laboratories or in those maintained by large insurance companies or industrial firms. Laboratory hygienists analyze air samples, do research on the reliability of health equipment such as respirators, or investigate the effects of exposure to chemicals or radiation. Some hygienists specialize in problems of air and water pollution. For example, these health professionals may work with government officials, environmental groups, organized labor, and plant management to develop a system to screen harmful substances before they enter and pollute a river.

Loss control and occupational health consultants (D.O.T. 168.168) in property-liability insurance companies perform many services for their clients. These range from correcting a single hazard in a small business to devising a program to eliminate or reduce all losses arising out of a large firm's operation. When dealing with a new account, the consultant makes a thorough inspection of the plant and then confers with management to formulate a program that meets the company's needs. The consultant may, for example, help set up plant health programs and medical services, assist plant personnel to insure that a new facility meets all safety requirements, or train plant safety people. Safety and health consultants also help their company's underwriters determine whether a risk is acceptable and the amount of premium to charge.



Industrial hygienist taking an air sample.

Places of Employment

An estimated 25,000 persons were engaged in occupational safety and health work in 1974. About one-quarter of these carried the professional designation, Certified Safety Professional, Certified Industrial Hygienist, or Member, Society of Fire Protection Engineers. Many others who are not certified performed professional level work, while a relatively small number were employed in the occupational safety and health field as technicians and inspectors. Property and liability insurance companies employ many occupational safety and health workers to provide engineering, consulting, and inspection services to their clients. Others worked for a variety of industrial, manufacturing, and commercial concerns.

These workers are needed wherever large numbers of people are concentrated and industrial development occurs. Insurance consultants generally have their headquarters in a region's major city and travel to and from the sites they visit.

Training, Other Qualifications, and Advancement

Entry level safety and health professionals generally need at least a bachelor's degree in engineering or a science. A more specialized degree, such as one in safety management, industrial safety, or fire protection engineering, often is helpful in getting a good job. Many employers prefer applicants with a graduate degree in areas such as industrial hygiene, safety engineering, or occupational safety and health engineering, or those with prior industrial work experience. Some employers will hire graduates of 2-year college curriculums as technicians, particularly if they have work experience related to the job.

Continuing education is necessary to stay abreast of changing technologies, new ideas, and emerging trends. Many insurance companies offer training seminars and correspondence courses for their staffs. The Occupational Safety and Health Administration (OSHA) conducts courses for safety and health workers on topics such as occupational injury investigation and radiological health hazards. The recognized marks of achievement in the field are the designations Certified Safety Professional; Certified Industrial Hygienist; and Member, Society of Fire Protection Engineers. Certification is conferred by the Board of Certified Safety Professionals, the American Board of Industrial Hygiene, or the Society of Fire Protection Engineers after the candidate completes the required experience and passes an examination.

In addition to technical competence, safety and health workers must be able to communicate well and motivate others. They should be able to adapt quickly to different situations, being equally at ease with a representative of a local union, a supervisor in the welding shop, or a corporate executive. Because physical activity is basic to the job, good physical condition is necessary.

Workers with proven ability will find much room for advancement. In the insurance business, safety and health workers can be promoted to department manager in a small branch office, move up to larger branch offices, and finally take an executive position in the home office. In industrial firms, they can advance to plant safety and health manager or corporate manager over several plants. Although extensive experience is required, technicians can advance to professional safety and health positions.

Employment Outlook

Employment of safety and health workers is expected to increase faster than the average for all occupations through the mid-1980's as growing concern for occupational safety and health and consumer safety continues to generate programs and jobs. Many openings will arise also to replace workers who die, retire, or leave their jobs for other reasons.

Much of the employment growth is expected to occur in industrial and manufacturing firms. Many firms now without a safety and health program are expected to establish one, and others will upgrade and expand existing programs in response to government requirements, union interest, and rising insurance costs. The number of safety and health workers in casualty insurance companies also will increase as more small employers request the services of their insurer's engineering or loss control department. Prospects should be best for graduates of occupational safety or health curriculums.

Earnings and Working Conditions

Salaries of safety and health workers vary widely according to education, experience, and specialty. In manufacturing firms, persons with a bachelor's degree generally started at about $10,000 a year in 1974, according to the limited data available. Those with a graduate degree salaries, and technicians somewhat lower ones. Safety and health workers with several years' experience averaged $15,000 to $20,000, and corporate managers well over $20,000 a year. Insurance companies started their loss consultant trainees at about $9,000; senior consultants earned $12,000 to $16,000; and department managers were paid over $20,000 in 1974.

The amount of travel required depends upon job specialty and geographic location. For example, the plant safety engineer may travel only to seminars and conferences,

while the insurance consultant may spend about half the time traveling between worksites. Usually, a car is furnished or safety professionals are reimbursed for the expenses of using their own vehicles.

Sources of Additional Information

For general information about professional safety careers, write to:

American Society of Safety Engineers, 850 Busse Highway, Park Ridge, Ill. 60068.

Also available from the Society is a booklet which lists colleges and universities offering degree programs in the occupational safety and health field.

Information concerning a career in industrial hygiene is available from:

American Industrial Hygiene Association, 665 Miller Rd., Akron, Ohio 44313.

Career information concerning fire protection engineering may be obtained from:

Society of Fire Protection Engineers, 60 Batterymarch St., Boston, Mass. 02110.

Career information on insurance loss control consulting is available from the home offices of many property-liability insurance companies.

OTHER SERVICE OCCUPATIONS

MAIL CARRIERS

(D.O.T. 233.138 and 233.388)

Nature of the Work

Most mail carriers travel planned routes delivering and collecting mail. Carriers start work at the post office early in the morning, where they spend a few hours arranging their mail for delivery, readdressing letters to be forwarded, and taking care of other details.

A carrier typically covers the route on foot, toting a heavy load of mail in a satchel or pushing it in a cart. In outlying suburban areas where houses are far apart, a car or small truck is sometimes needed to deliver mail. Residential carriers cover their routes only once a day, but carriers assigned a business district may make two trips or more. Deliveries are made house-to-house except in large buildings, such as apartments, which have all the mailboxes on the first floor.

Besides making deliveries, carriers collect postage-due and c.o.d. fees and obtain signed receipts for registered and sometimes for insured mail. If a customer is not home the carrier leaves a notice that tells where special mail is being held. Carriers also pick up letters to be mailed.

After completing their routes, carriers return to the post office with mail gathered from street collection boxes and homes. They may separate letters and parcels so that stamps can be canceled easily, and they turn in the receipts and money collected during the day.

Many carriers have more specialized duties than those described above. Some deliver only parcel post. Others collect mail from street boxes and office mail chutes. Rural carriers provide a wide variety of postal services. In addition to delivering and picking up mail, they sell stamps and money orders and accept parcels and letters to be registered or insured.

All carriers answer customers' questions about postal regulations and service and provide change-of-address cards and other postal forms when requested.

Training, Other Qualifications, and Advancement

Mail carriers must be at least 18 and pass a four-part written examination. The first part tests clerical accuracy by asking the applicant to compare pairs of addresses and indicate which are identical.

Carriers can work at their own pace as long as they cover their routes on time.

The second part tests ability to memorize mail distribution systems. The third measures reading ability, including vocabulary, and the fourth tests ability to do simple arithmetic.

Applicants must have a driver's license and pass a road test if the job involves driving. They also must pass a physical examination and may be asked to show that they can lift and handle mail sacks weighing up to 70 pounds. Applicants who have had health conditions that might interfere with work must have a special review to determine their eligibility.

Applicants should apply at the post office where they wish to work because each post office keeps a separate list of those who have passed the examination. Applicants' names are listed in order of their scores. Five extra points are added to the score of an honorably discharged veteran, and 10 extra points to the score of a veteran wounded in combat or disabled. Disabled veterans who have a compensable, service-connected disability of 10 percent or more are placed at the top of the list. When a vacancy occurs, the appointing officer chooses one of the top three applicants; the rest of the names remain on the list to be considered for future openings.

Mail carriers are classified as casual, part-time flexible, part-time regular, or full time. Casual workers are hired to help handle the Christmas mail. Part-time flexible employees do not have a regular work schedule but replace absent workers and help with extra work as the need arises. Part-time regulars have a set work schedule—for example, 4 hours a day.

New carriers are trained on the job. They may begin as part-time flexible city carriers and become regular or full-time carriers in order of seniority as vacancies occur. Advancement possibilities are limited, but carriers can look forward to obtaining preferred routes as city car-

riers or to obtaining jobs as rural carriers or carrier technicians as their seniority increases. A relatively small number of carriers become supervisors.

Employment Outlook

Employment of mail carriers—who numbered 267,000 in 1974—is expected to change very little through the mid-1980's. Although the amount of mail may increase along with growth in population and business activity, more efficient delivery of mail should limit the need for additional carriers. Most job openings will result from the need to replace experienced carriers who retire, die, or transfer to other occupations. Openings will be concentrated in metropolitan areas.

Earnings and Working Conditions

In mid-1974, part-time flexible carriers began at $4.77 an hour, with periodic increases up to $6.06 an hour after 8 years of service. Hourly wages of part-time regular workers were $4.61 an hour, with periodic increases up to $5.85 an hour after 8 years of service. By comparison, nonsupervisory workers in private industry, except farming, averaged $4.22 an hour.

Full-time city carriers are paid on an annual basis, beginning at $9,588 and increasing to a maximum of $12,173 after 8 years.

Rural carriers are paid a fixed annual salary plus an amount varying with the number of miles on their routes. They also receive an allowance of 15 1/2 cents a mile for the use of their automobiles. For example, as of mid-1974, the salary of a carrier with a 61-mile route (the average length) would begin at $9,730 a year and increase to $12,315 after 8 years. The automobile allowance would provide an extra $9.46 each workday. Substitute rural carriers receive the same pay as the regular carriers whose routes they are covering.

A full-time city carrier works an 8-hour day 5 days a week. City carriers who work more than 8 hours a day or 40 hours a week are paid one and one-half times their regular rate of pay for the extra hours. City carriers who work either full or part time receive 10 percent additional pay for work between 6 p.m. and 6 a.m. Rural carriers work either a 5- or 6-day week.

Most carriers begin work early in the morning, in some cases as early as 6 a.m. if they have routes in the business district. Carriers spend most of their time outdoors in all kinds of weather, walking from house to house with their heavy mailbags. Even those who drive must walk when making deliveries, and must lift heavy sacks of parcel post when loading their vehicles.

The job, however, has its advantages. Carriers who begin work early in the morning are through by early afternoon. They are also free to work at their own pace as long as they cover their routes within a certain period of time. Moreover, full-time postal employees have more job security than workers in most other industries.

(For information on fringe benefits, see the statement on Postal Service Occupations elsewhere in the *Handbook*.)

Sources of Additional Information

Local post offices and State employment service offices can supply details about entrance examinations and employment opportunities for mail carriers.

TELEPHONE OPERATORS

Nature of the Work

Although millions of telephone numbers are dialed each day without assistance, practically everyone sometimes makes a call that requires help from the operator. Often the operator is asked to reverse long distance charges, locate an individual, or indicate the cost of the call. Frequently the customer needs a correct number. The operator also may be needed to contact the police in an emergency, assist a blind person who is unable to dial, or arrange a conference call for business executives in different locations.

These and many other services are provided by two groups of operators—those at switchboards in telephone company central offices and those at private branch exchange (PBX) switchboards. Usually operators place calls by inserting and removing plugs that make switchboard connections and by listening and speaking into their headsets. Some switchboards are operated by pushbuttons or dials.

Telephone company operators may be assigned to handle either long distance calls or give directory assistance. Long distance operators obtain the information needed to complete the call, make the necessary connections, and record the details for billing. *Directory assistance operators* (D.O.T. 235.862) look up and provide telephone numbers. Service assistants train and help new operators to complete difficult calls. *PBX operators* (D.O.T. 235.862) run switchboards for business offices and other establishments. They connect interoffice or house calls, answer and relay outside calls, assist company employees in making outgoing calls, supply information to callers, and record charges. In many small establishments, PBX operators work at switchboards that serve only a limited number of telephones. These operators may do other office work such as typing or sorting mail and many also act as receptionists or information clerks. (The work of receptionists is described elsewhere in the *Handbook*.)

Some telephone operator switchboards operate by push buttons.

Places of Employment

About 390,000 telephone operators were employed in 1974; about one-half worked as operators in telephone companies and the rest as PBX operators in other types of businesses. A large number of PBX operators had jobs in manufacturing plants, hospitals, schools, and department stores. One-fourth of all operators worked part time.

Telephone company and PBX operators tend to be concentrated in heavily populated areas. Nearly one-fifth work in the New York, Chicago, and Los Angeles metropolitan areas.

Training, Other Qualifications, and Advancement

Persons planning to become telephone operators should like to serve the public, be pleasant and courteous, and be able to sit in a confined area for long periods. A clear and pleasing voice and good hearing also are important. High school courses in speech, office practices, and business math provide a helpful background. Most telephone companies and many large business firms require applicants to pass physical examinations.

New operators receive on-the-job training to become familiar with the equipment, records, and work. Operators first learn the procedures used to handle calls. Then they put through practice calls. After this instruction and practice—which usually lasts from 1 to 3 weeks—they are assigned to regular operator jobs and receive further instruction from supervisors.

PBX operators who handle routine calls may have a somewhat shorter training period than telephone company operators. In large businesses, an instructor from the local telephone company may train new employees.

Experienced telephone company operators may be promoted to clerical, craft, or supervisory jobs. Similar opportunities exist for PBX operators in large firms; in many small businesses, however, opportunities for advancement are limited.

Employment Outlook

Employment of telephone and PBX operators as a group is expected to show little or no change through the mid-1980's. Nevertheless, thousands of full-time and part-time workers will be hired each year. Some will be needed to replace experienced operators who die, retire, or stop working for other reasons. Many other openings will result from the need to replace operators who advance to other occupations.

Employment of telephone company operators is expected to decline slightly. As more companies start charging customers for directory assistance and information calls, more people will dial numbers directly and use telephone directories to locate unknown numbers, thus reducing the need for operators.

Employment of PBX operators is not expected to change significantly even though more small businesses will require PBX services. Employment growth will be limited as many large businesses convert to Central Exchange (CENTREX). With CENTREX, incoming and outgoing calls can be dialed directly without an operator's assistance.

Earnings and Working Conditions

Telephone company operators in training averaged $3.40 an hour in early 1974; experienced operators $4.20; service assistants $5.20; and managers $7.12. Contracts between unions and telephone companies generally provide for periodic pay increases and extra pay for work on evenings, Sundays, and holidays.

Most telephone company and PBX operators work between 35 and 40 hours a week. Often, their scheduled hours are the same as those of other clerical workers in the business community. In telephone companies, however, and in hotels, hospitals, and other places where telephone service is on a 24-hour basis, operators usually work on shifts and on holidays and weekends. Some operators work split shifts—that is, they are on duty during the peak calling periods in the late morning and early evening, and have time off between these two periods.

Operators usually work in well-lighted and pleasant surroundings. Lounges often are provided for relaxation during breaks in their scheduled hours. Insurance, pension programs, holidays, vacations, and other fringe benefits are much the same as those for other types of clerical employees. For information about fringe benefits for telephone company operators, see the statement on the Telephone Industry elsewhere in the *Handbook*.

Many operators employed by telephone companies are members of the Communications Workers of

America, the International Brotherhood of Electrical Workers, and the Alliance of Independent Telephone Unions.

Sources of Additional Information

For more details about employment opportunities, contact the telephone company in your community or local offices of the unions that represent telephone workers. For general information on telephone operator jobs, write to:

Alliance of Independent Telephone Unions, P.O. Box 5462, Hamden, Conn. 16518.

United States Independent Telephone Association, 1801 K St. NW., Suite 1201, Washington, D.C. 20006.

Communications Workers of America, 1925 K St. NW., Washington, D.C. 20006.

International Brotherhood of Electrical Workers, 1200 15th St. NW., Washington, D.C. 20005.

EDUCATION AND RELATED OCCUPATIONS

More and more people are going to school for a greater portion of their lives than ever before, as increasingly complex and specialized skills and knowledge are called for in our growing economy. In addition, people of all ages are seeking to use their leisure time for personal growth and development. Teachers and librarians play vital roles in the educational process; their occupations are discussed in the following sections.

TEACHING OCCUPATIONS

Teaching is the largest of the professions; over 2.7 million full-time teachers were employed in 1973-74 in the Nation's elementary and secondary schools and colleges and universities. In addition, thousands taught part time; among them were many scientists, physicians, accountants, members of other professions, and graduate students. Similarly, large numbers of craft workers instructed part time in vocational schools. Many other people taught in preschool and adult education and recreation programs.

The number of teachers required in the future will depend on the number of students enrolled and the number of persons who leave the profession. New teachers also will be needed to allow the average size of classes to be lowered.

Detailed information on teaching occupations and the outlook for teachers through the mid-1980's is presented in the following statements.

KINDERGARTEN AND ELEMENTARY SCHOOL TEACHERS

(D.O.T. 092.228)

Nature of the Work

Kindergarten and elementary school teachers introduce children to numbers, language, science and social studies, and develop students' capabilities in these subject areas. Their primary job is to provide a good learning environment and to plan and present programs of instruction using materials and methods designed to suit the students' needs.

Most elementary school teachers instruct a single group of 25 to 30 children in several subjects. In some schools two teachers or more "team teach" and are jointly responsible for a group of students or for a particular subject. A recent survey indicates that about 1 public elementary school teacher in 6 is a member of a teaching team.

An increasing number of elementary school teachers specialize in one or two subjects and teach these subjects to several classes; 1 teacher in every 5 teaches on this departmentalized basis. Some teach special subjects such as music, art, or physical education, while others teach basic subjects such as English, mathematics, or social studies.

Besides the actual student instruction, teachers participate in many activities outside the classroom. They generally must attend regularly scheduled faculty meetings and may serve on faculty committees. They must prepare lessons and evaluate student performance. They also work with students who require special help and confer with parents and other school staff. To stay up-to-date on educational materials and teaching techniques, they participate in workshops and other inservice activities.

New forms of instructional media give teachers more opportunities to work with students. Also, about 4 out of every 10 public elementary school teachers have aides who generally do secretarial work and help supervise lunch and playground activities. Thus, growing numbers of teachers are freed from routine duties and can give more individual attention to students.

Places of Employment

About 1.3 million people—85 percent of them women—worked as elementary school teachers in 1974. An increasing number of men, concentrated heavily in the upper grades, teach at the elementary level.

Most teachers work in public elementary schools that have six grades; however, some teach in middle schools—schools that cover the 3 or 4 years between the lower elementary grades and 4 years of high school. Only about 12 percent of elementary school teachers work in nonpublic schools.

More than one-third of all public elementary teachers teach in urban areas; about one-fifth in cities of 250,000 or more; one-eighth in rural areas; and the remainder in small towns or suburban areas.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require public elementary school teachers to be certified by the department of education in the State in which they work. Some States also require certification of teachers in private and parochial schools.

To qualify for certification, a teacher must study 4 years at an institution with an approved teacher education program. Besides a bachelor's degree which provides the necessary liberal arts background, States require that prospective teachers have student-teaching and education courses.

In 1974, 13 States required teachers to get supplementary post-graduate education—usually a master's degree or a fifth year of study—within a certain period after their initial certification. Some States required U.S. citizenship;

some an oath of allegiance; and several a health certificate.

Local school systems sometimes have additional requirements for employment. Students should write to the local superintendent of schools and to the State department of education for information on specific requirements in the area in which they want to teach.

In addition to educational and certification requirements, a teacher should be dependable, have good judgment, and should have the desire and ability to work with children. Enthusiasm for teaching and the competence to handle classroom situations also are important.

Opportunities for advancement in elementary teaching come principally with experience. Teachers may advance within a school system or transfer to another which recognizes experience and has a higher salary scale. Some teachers may advance to supervisory, administrative, or specialized positions. Advancement for most teachers consists of higher pay rather than more responsibility or a higher position, however.

Employment Outlook

Kindergarten and elementary school teachers are expected to face competition for jobs through the mid-1980's. If patterns of entry and reentry to the profession continue in line with past trends, the number of persons qualified to teach in elementary schools will exceed the number of openings.

The basic sources of teacher supply are recent college graduates qualified to teach at the elementary level and teachers seeking reentry to the profession. Reentrants, although more experienced, will face increasing competition from new graduates who command lower salaries and have more recent training.

Pupil enrollment is the basic factor underlying the need for teachers. Because of fewer births in the 1960's, elementary enrollments have been on the decline since they peaked at nearly 32 million in 1967. The National Center of Education Statistics projects that by 1979 the downward enrollment trend will halt at a level of 27 million, and enrollments again will advance to nearly 29 million by 1985.

However, a decline in the projected number of children born over the next decade could lessen the demand for teachers. While the trend has not been clearly established, since 1970 women have continued to have fewer children, and according to a recent survey, they expect to continue having smaller families than were common 10 years ago.

Teachers will be needed to fill new positions created by larger enrollments; to replace those who are not now certified; to meet the expected pressure for an improved pupil-teacher ratio; and to fill positions vacated by teachers who retire, die, or leave the profession for other reasons.

While the outlook based on past trends points to a competitive employment situation through the mid-1980's, several factors could influence the demand for teachers. Increased emphasis on early childhood education, on special programs for disadvantaged children, and on individual instruction may result in larger enrollments, smaller student-teacher ratios, and consequently an increased need for teachers. However, possible budget restraints for educational services might limit expansion.

Earnings and Working Conditions

According to the National Education Association, public elementary school teachers in 1974-75

averaged $11,234 a year. Average earnings in 1974 were over one and one-third times as much as the average earnings for all nonsupervisory workers in private industry, except farming. In the five highest paying States (Alaska, New York, Hawaii, California, and Illinois), teachers' salaries averaged more than $12,600; in the 10 States having the lowest salaries (Mississippi, Arkansas, Vermont, South Dakota, Kentucky, Oklahoma, North Dakota, South Carolina, West Virginia, and Nebraska), they averaged less than $9,200.

Public schools systems enrolling 6,000 or more pupils paid teachers with a bachelor's degree average starting salaries of $7,720 a year in 1973-74; those with a master's degree earned a starting average of $8,586.

Public elementary school teachers worked an average of about 36-1/2 hours a week in 1974. Additional time spent preparing lessons, grading papers, making reports, attending meetings, and supervising extra-curricular activities increased the total number of hours to about 46.

The elementary school teacher usually works 9 months and averages 181 days in the classroom and 4 workdays on nonteaching activities. In addition, many teach summer sessions, and others take courses for professional growth or work at other jobs during the summer months.

Employment in teaching is steady, and business conditions usually do not affect the market for teachers. In 1974, 38 States and the District of Columbia had tenure laws that insured the jobs of teachers who had successfully taught for a certain number of years.

Collective bargaining agreements cover an increasingly large number of teachers. In 1974, 31 States had enacted laws which required collective bargaining in the teacher contract negotiation process. Most public school systems that enroll 1,000 students or more bargain with teacher organizations over wages, hours, and the terms and conditions of employment.

Sources of Additional Information

Information on schools and certification requirements is available from local school systems and State departments of education.

Information on the Teacher Corps, internships, graduate fellowships, and other information on teaching may be obtained from:

U.S. Department of Health, Education, and Welfare, National Center for Education Statistics, Washington, D.C. 20202.

Other sources of general information are:

American Federation of Teachers, 1012 14th St. NW., Washington, D.C. 20005.

National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

SECONDARY SCHOOL TEACHERS

(D.O.T. 091.228)

Nature of the Work

Secondary school teachers help prepare their students for future roles as citizens and jobholders. They introduce students to subjects ranging from world history and elementary algebra to anthropology and computer mathematics.

Secondary school teachers usually specialize in a particular field. English, mathematics, social studies, and science are the subjects most commonly taught. Other specialties include health and physical education, business education, home economics, foreign languages, and music. Increasingly, teachers are developing courses which deal with particular areas within the broad subjects so students may acquire in-depth as well as general knowledge of a field.

Secondary school teachers usually conduct classes in their specialty for five groups of students a day. The average daily pupil load for public shool teachers is 136 students.

Teachers design their classroom presentation to meet the demands of balanced curriculum and to suit the individual student's needs. Secondary school teachers instruct students at a single grade level or from different grades. They must consider instructional methods and materials that best meet the student's needs, as well as the subject matter.

Secondary school teachers also supervise study halls and homerooms, prepare lessons, grade papers, evaluate students, and attend meetings with parents and school personnel. Often they work with student groups outside of class. Teachers also participate in activities, such as workshops and college classes, to keep up-to-date on their subject specialty and on current trends in education.

Increasingly, in recent years, teachers have been able to devote more time towards improved instruction due to the increased availability of teacher aides who perform secretarial work, grade papers, and do other routine tasks. Developments in educational technology also have provided teachers with instructional media and other new materials and techniques to improve student learning.

Places of Employment

More than 1 million teachers worked in secondary schools in 1974. Of these, about one-half were women.

According to a recent survey, slightly more than one-half of all public secondary teachers work in senior high schools; about one-third teach at the junior high level. About one-tenth teach in junior-senior high schools, and a very small

number are elementary-secondary combination teachers.

Of those in public schools, about 1 teacher in 5 works in a city with a population of 250,000 or more—1 in 8 in a city of less than 250,000. Over one-half teach in small-town or suburban schools; and about 1 in 7 in a rural location. Only about 1 teacher in 14 works in a nonpublic school.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia require the certification of public secondary school teachers. Many States also require certification of secondary teachers in private and parochial schools.

In every State, the minimum educational requirement for certification is a bachelor's degree. Moreover, 14 States have specified that a secondary school teacher must get additional education, usually a fifth year of study or a master's degree, within a certain period after beginning employment.

In 1974, the District of Columbia was the only jurisdiction requiring a master's degree for initial certification as a senior high school teacher. However, according to a recent national survey, 2 out of every 5 public secondary school teachers had a master's or higher degree.

The educational qualifications for secondary school teachers vary by State and by school system. Approved colleges and universities in every State offer programs which include the education courses and student-teaching that States require. They also offer the academic courses which qualify teachers in subject specialties taught at the secondary level.

States and local jurisdictions often have general teacher requirements, such as the recommendation of the college, a certificate of health, and citizenship. Prospective teachers may get complete information on such educational and general requirements from each State department of education and from the superintendent of schools in each community.

Personal qualifications which a secondary teacher must have include a desire to work with young people, an interest in a special subject, and the ability to motivate students and to relate knowledge to them.

For secondary teachers, education and experience provide the primary bases for advancement. Advancement to supervisory and administrative positions usually requires at least 1 year of professional education beyond the bachelor's degree and several years of successful classroom teaching. Some experienced teachers with special preparation may work as special school service personnel, such as school psychologists, reading specialists, or guidance counselors. Often these jobs require special certification as well as special education.

Employment Outlook

The supply of secondary school teachers through the mid-1980's will greatly exceed anticipated requirements if past trends of entry into the profession continue. As a result, prospective teachers are likely to face keen competition for jobs.

The prime sources of teacher supply are recent college graduates qualified to teach secondary school and teachers seeking to reenter the profession. Although reentrants have experience in their favor, many schools may prefer to hire new graduates who command lower salaries and whose training is more recent.

Pupil enrollment is the basic factor underlying the demand for teachers. The National Center for Education Statistics' projections indicate that enrollments in secondary schools will begin to decline in the mid-1970's after continuous growth through the 1960's and into the early 1970's. This decline in enrollments is expected to reduce the demand for teachers. As a result, over the 1974-85 period, nearly all teaching positions will stem from the need to replace teachers who die, retire, or leave the profession for other reasons. As a result, an increasing proportion of prospective teachers will have to consider alternatives to secondary school teaching. However, pressures for an improved pupil-teacher ratio and replacement of noncertified teachers could create additional openings.

Although the overall outlook for secondary teachers indicates a highly competitive market, employment conditions may be more favorable in certain fields. According to a recent survey, teacher supply was least adequate in mathematics, natural and physical sciences, industrial arts, special education, and some vocational-technical subjects.

Earnings and Working Conditions

According to the National Education Association, public secondary school teachers in 1974-75 averaged $11,826. This is one and one-half times the average for nonsupervisory workers in private industry, except farming. In the five

highest paying States (New York, California, Alaska, Illinois, and Michigan), teachers' salaries averaged more than $13,000; in the five States having the lowest salaries (Arkansas, Kentucky, Mississippi, South Dakota, and Oklahoma), they averaged under $9,300 a year.

Beginning teachers with a bachelor's degree in school systems with enrollments of 6,000 or more earned average salaries of $7,720 in the school year 1973-74. New teachers with a master's degree started at $8,586 a year. Beginning teachers could expect regular salary increases as they gained experience and additional education.

A recent survey of public school teachers indicated that the average required school week for those in secondary schools was 37 hours. However, when all teaching duties, including meetings, lesson preparation, and other necessary tasks are taken into consideration, the total number of hours spent working each week was slightly more than 48.

In some schools, teachers receive supplementary pay for certain school-related activities such as coaching students in sports and working with students in extracurricular activities, in music, dramatics, or school publications. About one-fourth of the public secondary teachers receive pay for extra duties, such as supervising extracurricular activities, and one-third supplement their incomes with earnings from additional school work.

One-sixth of public school teachers also work in their school systems during the summer. More than one-fourth hold summer jobs outside the school system. In all, about three-fifths of public secondary school teachers have extra earnings from summer work, additional school-year work, or a combination of the two.

During the school year, teachers work an average of 181 days. They average 26 teaching periods and 5 unassigned periods a week. Laws in 38 States and the District of Columbia ensure the employment of those who have achieved tenure status. Laws requiring collective bargaining of wages, hours, and the terms and conditions of employment cover increasing numbers of teachers.

Sources of Additional Information

Information on schools and certification requirements is available from local school systems and State departments of education.

Information on the Teacher Corps, internships, graduate fellowships, and other information on teaching may be obtained from:

U.S. Department of Health, Education, and Welfare, National Center for Education Statistics, Washington, D.C. 20202.

Other sources of general information are:

American Federation of Teachers, 1012 14th St. NW., Washington, D.C. 20005.

National Education Association, 1201 16th St. NW., Washington, D.C. 20036.

COLLEGE AND UNIVERSITY TEACHERS

(D.O.T. 090.168 through .999)

Nature of the Work

About 30 percent of all persons in the United States between the ages of 18 and 21 attended college in 1974. To meet the demand of students for higher education, colleges and universities hire teachers to provide instruction in many fields. The most common subjects include social sciences, teacher education, the physical sciences, health professions, fine and applied arts, English, the biological sciences, mathematics, foreign languages, and business and commerce.

Slightly more than one-half of all college and university teachers instruct undergraduates; another one-third teach both graduates and undergraduates; and about one-tenth work only with graduate students.

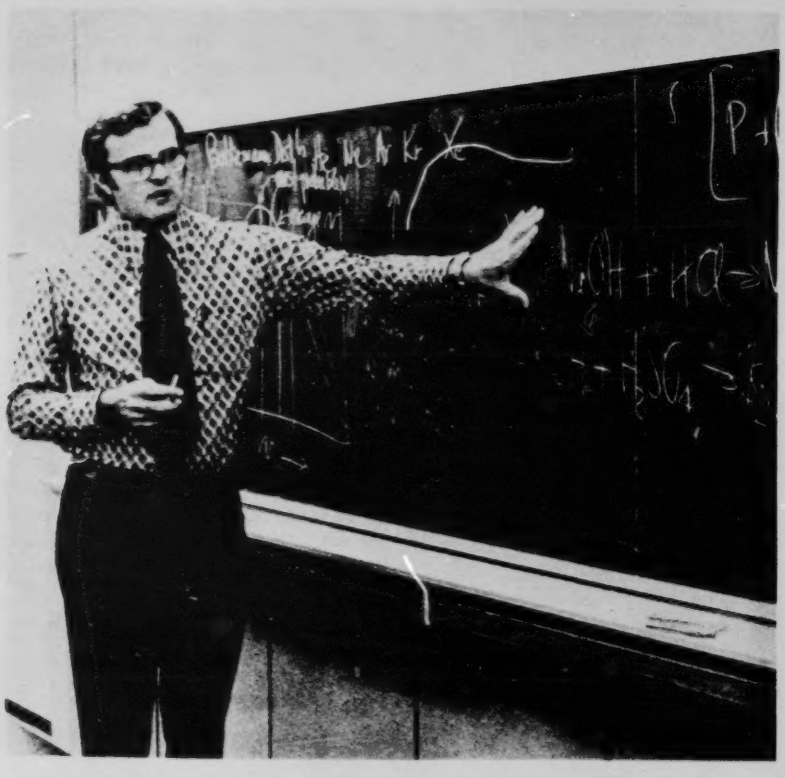
Most teachers lecture and conduct classroom discussions to present subject matter effectively. Many work with students in laboratories. Some teachers provide individual instruction or supervise independent study. Nearly one-third of the faculty in universities have teaching assistants. Some college and university teachers use closed-circuit television. In 2-year colleges especially, instruction is frequently machine-aided.

To be effective, college teachers must keep up with developments in their field by reading current material, participating in professional activities, and conducting research. Some publish books and articles. The importance of research and publication varies from one institutional level to another. In universities, about 70 percent of the faculty have published professional articles compared to 25 percent of 2-year college faculty. Also, in certain fields such as engineering and the physical sciences, the demand for research is strong.

In addition to time spent on preparation, instruction, and evaluation, college and university teachers participate in faculty activities; work with student organizations and individual students outside of classes; work with the college administration; and in other ways serve the institution and the community. Some are department heads and have supervisory duties.

Places of Employment

In 1974, about 622,000 teachers worked in more than 2,600 colleges and universities. About one-fourth of all college and university teachers are women. An estimated 399,000—nearly two-thirds—were



full-time senior staff. Of the remainder, about 112,000 were part-time senior staff, and nearly 16,000 were full-time junior instructors; the rest generally worked as part-time assistant instructors, teaching fellows, teaching assistants, or laboratory assistants.

Of full-time faculty, about one-third teach in universities; nearly one-half work in 4-year colleges; and about one-seventh teach in 2-year colleges. About two-thirds of the faculty in universities and 4-year colleges teach in public institutions; nearly nine-tenths of the faculty in 2-year institutions work in public junior and community colleges.

Training, Other Qualifications, and Advancement

Most college and university faculty are classified in four academic ranks: instructors, assistant professors, associate professors, and full professors. About 75 percent of all faculty are assistant, associate, or full professors, with the three ranks equally distributed. Ten percent are instructors.

To get an initial appointment, instructors generally must have a master's degree. For advancement to higher ranks, they need further academic training plus experience. Assistant professors usually need a year of graduate study beyond the master's degree and at least a year or two of experience as an instructor. Appointments as associate professors frequently demand the doctoral degree and an additional 3 years or more of college teaching experience. For a full professorship, the doctorate and extensive teaching experience are essential.

In addition to advanced study and college-level teaching experience, outstanding academic, administrative, and professional contributions influence advancement. Research, publication, and work experience in a subject area may hasten advancement.

The ranks of college and university teachers and their educational backgrounds differ by institutional level. In universities, more than 50 percent of the faculty have doctoral degrees compared with about 10 percent in 2-year colleges. Correspondingly, more than 50 percent of the faculty in universities are either professors or associate professors, while in 2-year colleges, only 1 teacher in 4 is within these upper ranks. Conversely, in community and junior colleges, where the master's is the highest degree held by nearly three-fourths of the faculty, instructors constitute a relatively large faculty segment.

Employment Outlook

College and university teaching candidates are expected to face keen competition through the mid-1980's. The demand for college and university teachers is expected to fall. However, the principal source of teacher supply—master's and Ph. D. degree recipients—is expected to continue to grow. Consequently, a smaller proportion of each year's degree recipients will be needed for college teaching. An increasing proportion of prospective college teachers, therefore, will have to seek nonacademic jobs. Government and private industry should provide some positions, but some persons holding graduate degrees may find it necessary to enter occupations that have not traditionally required advanced study.

The basic factor underlying the demand for teachers is college enrollment. During the 1960's and early 1970's, teacher employment expanded due to growth in both the number of college-age persons and the proportion of 18- to 21-year-

olds enrolled in college. The number of college-age persons will decline after 1978, and by the early 1980's, enrollment will taper off and begin to fall. As a result, the total number of college teachers needed over the 1974-85 period will decline, as compared with an 80 percent increase over the previous 11-year period.

The type and level of the institution and the extent to which it wishes to upgrade its faculty also will influence the demand for teachers. Although enrollments in the 1970's are expected to stabilize in 4-year colleges and universities, many institutions, including junior and community colleges, may hire additional Ph. D.'s to upgrade their faculties. Master's degree holders also will continue to find jobs in 2-year colleges. Public institutions are expected to continue to attract an increasing proportion of total college enrollment. Thus, opportunities in public colleges will be greater than in private institutions.

Earnings and Working Conditions

In 1974-75, full-time college and university faculty on 9-10 month contracts averaged $16,704, or twice the average earnings for all nonsupervisory workers in private industry, except farming. Salaries varied, however, by teacher rank and by institutional level. Average salaries were:

Instructors	$12,825
Assistant professors	13,104
Associate professors	15,920
Professors	20,653

In general, larger institutions paid higher salaries. Salaries of teachers in 4-year colleges tended to be higher than those in 2-year colleges; university teachers averaged the most.

College and university teachers' salaries also vary by geographic region. According to a recent survey of 4-year colleges and universities, schools in the Mideast, New England, and Pacific regions paid the highest full-time faculty salaries.

Since about 2 out of 3 college teachers have 9 to 10-month contracts, many have additional summer earnings from research, writing for publication, or other employment. Royalties and fees for speaking engagements may provide additional earnings. Some teachers also undertake additional teaching or research projects or work as consultants.

College and university teachers also may enjoy certain benefits, including tuition waivers for dependents, housing allowances, travel allowances, and leaves of absence. Colleges typically grant a semester's leave after 6 or 7 years of employment.

About 85 percent of all college and university teachers work in institutions which have tenure systems. Of the full-time teachers employed in these institutions, over one-half are tenured. Under a tenure system, a teacher usually receives 1-year contracts during a probationary period ranging from 3 to 7 years; some universities award 2- or 3-year contracts. After the probationary period, institutions consider teachers for tenure (the assurance of continuing employment with freedom from dismissal without cause).

The working hours and environment of college teachers generally are favorable. Classrooms, office facilities, and laboratories usually are well-equipped and teachers have access to library facilities and clerical assistance.

College teachers usually have flexible teaching schedules. According to a recent survey, the undergraduate faculty in 4-year colleges and universities normally teach 12 hours a week and seldom more than 14 or 15 hours. Graduate faculty have a teaching load of about 10 hours a week. In addition to time spent in the classroom, college and university teachers devote much time to preparation and other duties. Overall, full-time faculty spend about 40 hours a week on school-related activities. For faculty in junior and community colleges, the normal teaching load is slightly heavier, but the total number of hours on the job are fewer.

Sources of Additional Information

Information on college teaching as a career is available from:

U.S. Department of Health, Education, and Welfare, National Center for Education Statistics, Washington, D.C. 20202.

American Council on Education, 1 Dupont Circle NW., Washington, D.C. 20036.

American Federation of Teachers, 1012 14th St. NW., Washington, D.C. 20065.

Professional societies in the various subject fields will generally provide information on teaching requirements and employment opportunities in their particular fields. Names and addresses of societies are given in the statements on specific professions elsewhere in the *Handbook*.

LIBRARY OCCUPATIONS

People in all walks of life are in the midst of an information explosion. Worlds and ideas are being explored that just a few years ago were beyond imagination, and information is growing at a rapid pace. The main storehouses of information are the Nation's libraries.

Librarians and library technicians and assistants serve library users of all ages and lifestyles. They provide the public with access to books, periodicals, and other printed materials, as well as less conventional forms of information such as microfilms, slides, and computer tapes. The following statements describe their work in more detail.

LIBRARIANS

(D.O.T. 100.118 through .388)

Nature of the Work

Making information available to people is the job of librarians. They select and organize collections of books, pamphlets, manuscripts, periodicals, clippings, and reports, and assist readers in their use. In many libraries, they also provide phonograph records, maps, slides, pictures, tapes, films, paintings, braille and talking books, microfilms, and computer tapes.

User services and technical services are the two principal kinds of library work. Librarians in user services—for example, reference and children's librarians—work directly with the public. Librarians in technical services—for example, catalogers and acquisitions librarians—deal less frequently with the public; they order, classify, catalog, and in other ways prepare the materials for use.

The size of the library determines to a large extent the scope of a librarian's job. In small libraries, the job may include both user and technical services. The librarian may select and organize materials, publicize services, do research, and give reference help to groups and individuals. In large libraries, librarians usually specialize in either user or technical services. They may specialize further in certain areas, such as science, business, the arts, or medicine. Their work may involve reviewing and abstracting published materials and preparing bibliographies in their specialty.

Librarians generally are classified according to the type of library in which they work: public libraries, school media centers, college and university libraries, and special libraries.

Public librarians serve all kinds of people—children, students, research workers, teachers, and others. Increasingly, public librarians are providing special materials and services to culturally and educationally deprived persons, and to persons who because of physical handicaps cannot use conventional print.

The professional staff of a large public library system may include the chief librarian, an assistant chief, and several division heads who plan and coordinate the work of the entire library system. The system also may include librarians who supervise branch libraries and specialists in certain areas of library

work. The duties of some of these specialists are briefly described in the following paragraphs.

Acquisition librarians purchase books and other materials and maintain a well-balanced library that meets the needs and interests of the public. *Catalogers* classify these materials by subject and otherwise describe them to help users find what they are looking for. *Reference librarians* answer specific questions and suggest sources of information that may be useful.

Some librarians work with specific groups of readers. *Children's librarians* serve the special needs of young people by finding books they will enjoy and showing them how to use the library. They may plan and conduct special programs such as story hours or film programs. Their work in serving children often includes working with school and community organizations. *Adult services librarians* suggest materials suited to the needs and interests of adults. They may cooperate in planning and conducting education programs, such as community development, public affairs, creative arts, problems of the aging, and home and family. *Young adult services librarians* help junior and senior high school stu-

dents select and use books and other materials. They may organize programs of interest to young adults, such as book or film discussions or concerts of recorded popular and classical music. They also may coordinate the library's work with school programs. *Extension or outreach librarians working in bookmobiles* offer library services to people not adequately served by a public library such as those in inner city neighborhoods, migrant camps, rural communities, and institutions, including hospitals and homes for the aged.

School librarians instruct students in the use of the school library and help them choose from the media center's collection of print and nonprint materials items that are related to their interests and to classroom subjects. Working with teachers and supervisors, school librarians familiarize students with the library's resources. They prepare lists of materials on certain subjects and help select materials for school programs. They also select, order, and organize the library's materials. In some schools, they may work with teachers to develop units of study and independent study programs, or they may participate in team teaching. Very large high schools may employ several school librarians, each responsible for a particular function of the library program or for a special subject area.

College and university librarians serve students, faculty members, and research workers in institutions of higher education. They may provide general reference service or may work in a particular subject field, such as law, medicine, economics, or music. Those working on university research projects operate documentation centers that use computers and other modern devices to record, store, and retrieve specialized information. College and university librarians may teach classes in the use of the library.

Special librarians work in libraries maintained by government agencies and by commercial and industrial firms, such as pharmaceutical companies, banks, advertising agencies, and research laboratories. They provide materials and services covering subjects of special interest to the organization. They build and arrange the organization's information resources to suit the needs of the library users. Special librarians assist users and may conduct literature searches, compile bibliographies, and in other ways provide information on a particular subject.

Others called *information science specialists*, like special librarians, work in technical libraries or information centers of commercial and industrial firms, government agencies, and research centers. Although they perform many duties of special librarians, they must possess a more extensive technical and scientific background and a knowledge of new techniques for handling information. Information science specialists abstract complicated information into condensed, readable form, and interpret and analyze data for a highly specialized clientele. Among other duties, they develop classification systems, prepare coding and programming techniques for computerized information storage and retrieval systems, design information networks, and develop microfilm technology.

Information on library technicians and assistants is found in a separate statement in the *Handbook*.

Places of Employment

Of the estimated 125,000 professional librarians employed in 1974, school librarians accounted for nearly one-half; public libraries and colleges and universities each employed about one-fifth. An estimated one-seventh worked in special libraries, including libraries in government agencies. Some librarians worked in correctional institutions, hospitals, and State institutions, while a small number served as consultants, and State and Federal Government administrators and faculty in schools of library science. The Federal Government employed about 3,200 professional librarians.

More than 85 percent of all librarians are women. In college and university libraries, however, men make up about 35 percent of the total professional staff. Men also are relatively numerous in law libraries and in special libraries concerned with science and technology.

Most librarians work in cities and towns. Those attached to bookmobile units serve widely scattered population groups.

Training, Other Qualifications, and Advancement

A professional librarian ordinarily must complete a 1-year master's degree program in library science. A Ph. D. degree is an advantage to those who plan a teaching career in library schools or who aspire to a top administrative post, particularly in a college or university library or in a large library system. For those who are interested in the special libraries field, a master's degree or doctorate in the subject of the library's specialization is highly desirable

In 1974, 53 library schools in the United States were accredited by the American Library Association and offered a master's degree in library science (M.L.S.). In addition, many other colleges offer graduate programs or courses within 4-year undergraduate programs.

Most graduate schools of library science require graduation from an accredited 4-year college or university, a good undergraduate record, and a reading knowledge of at least one foreign language. Some schools also require introductory un-

dergraduate courses in library science. Most prefer a liberal arts background with a major in an area such as the social sciences, the arts, or literature. Some schools require entrance examinations.

Special librarians and information science specialists must have extensive knowledge of their subject matter as well as training in library science. In libraries devoted to scientific information, librarians should be proficient in one foreign language or more. They also must be well informed about computerized methods for storing and retrieving technical information.

Most States require that public school librarians be certified and trained both as teachers and librarians. The specific education and experience necessary for certification vary according to State and the school district. The local superintendent of schools and the State department of education can provide information about specific requirements in an area.

In the Federal Government, beginning positions require completion of a 4-year college course and a master's degree in library science, or demonstration of the equivalent in experience and education by a passing grade on an examination.

Many students attend library schools under cooperative work-study programs that combine the academic program with practical work experience in a library. Scholarships for training in library science are available under certain State and Federal programs and from library schools, as well as from a number of the large libraries and library associations. Loans, assistantships, and financial aid also are available.

Librarians should be intellectually curious and able to express themselves verbally, and should have the desire and ability to help others use library materials.

Experienced librarians may advance to administrative positions or to specialized work. Promotion to these positions, however, is limited primarily to those who have completed graduate training in a library school, or to those who have specialized training.

Employment Outlook

The employment outlook for librarians is expected to be somewhat competitive through the mid-1980's. Although employment in the field is expected to grow over the period, the supply of persons qualified for librarianship is likely to expand as an increasing number of new graduates and labor force reentrants seek jobs as librarians.

The anticipated increase in demand for librarians in the late 1970's and early 1980's will not be nearly as great as it was in the 1960's. Then, school enrollments were rising rapidly and Federal expenditures supported a variety of library programs.

Fewer births during the 1960's will result in a slight decline in elementary and secondary school enrollments through the remainder of the 1970's and early 1980's. The effect of birth rates in the 1960's will begin to be manifested in colleges and universities in the early 1980's, when total degree-credit enrollment is expected to level off. In both the schools and the colleges and universities, as a result, the demand for librarians will increase at a slower pace than in the past.

On the other hand, requirements for public librarians are expected to increase through 1985. The growth of a better educated population will necessitate an increased number of librarians to serve the public. The educationally disadvantaged, handicapped, and various minority groups also will need qualified librarians to provide special services. Also, the expanding use of computers to store and retrieve information will contribute to the increased demand for information specialists and library automation specialists in all types of libraries.

In addition to openings from growth, replacements will be needed each year for librarians who retire, die, transfer to other types of work, or leave the labor force.

Employment opportunities will vary not only by type of library but also by the librarian's educational qualifications and area of specialization. Although the overall employment outlook is competitive, persons who are willing to seek positions in other geographical areas and in different types of libraries will have better opportunities. New graduates having more recent training may have an employment advantage over reentrants, delayed entrants, or transfers to the profession. Their lower beginning salaries, compared to more experienced workers, may also be an employment advantage.

Earnings and Working Conditions

Salaries of librarians vary by type of library, the individual's qualifications, and the size and geographical location of the library.

Starting salaries of graduates of library school master's degree programs accredited by the American Library Association averaged $9,423 a year in 1974, ranging from $8,956 in public libraries to $9,864 in special libraries. The average annual salary for special librarians was $13,900 in 1974. For librarians in college and university libraries, average salaries ranged from $8,700 a year for those with limited experience working in private 4-year colleges to over $13,000 for university librarians with more extensive experience. Salaries for library administrators ranged somewhat higher. Department heads in college libraries earned between $10,000 and $14,000 a year. In general, librarians earned about one and one-half times as much as the average for all nonsupervisory workers in private industry, except farming.

In the Federal Government, the entrance salary for librarians with a master's degree in library science was $12,841 a year in late 1974. The average salary for all librarians in the Federal Government was $17,013.

The typical workweek for librarians is 5 days, ranging from 35 to 40 hours. The work schedule of public and college librarians may include some weekend and evening work. School librarians generally have the same workday schedule as classroom teachers. A 40-hour week during normal business hours is common for government and other special librarians.

The usual paid vacation after a year's service is 3 to 4 weeks. Vacations may be longer in school libraries, and somewhat shorter in those operated by business and industry. Many librarians are covered by sick leave; life, health, and accident insurance; and pension plans.

Sources of Additional Information

Additional information, particularly on accredited programs and scholarships or loans, may be obtained from:

American Library Association, 50 East Huron St., Chicago, Ill. 60611.

For information on requirements for special librarians, write to:

Special Libraries Association, 235 Park Ave., South, New York, N.Y. 10003.

Information on Federal assistance for library training under the Higher Education Act of 1965 is available from:

Office of Libraries and Learning Resources, Office of Education, U.S. Department of Health, Education, and Welfare, Washington, D.C. 20202.

Those interested in a career in Federal libraries should write to:

Secretariat, Federal Library Committee, Room 310, Library of Congress, Washington, D.C. 20540.

Material on information science specialists may be obtained from:

American Society for Information Science, 1140 Connecticut Ave. NW., Washington, D.C. 20036.

Individual State library agencies can furnish information on scholarships available through their offices, on requirements for certification, and general information about career prospects in their regions. State boards of education can furnish information on certification requirements and job opportunities for school librarians.

LIBRARY TECHNICIANS AND ASSISTANTS

(D.O.T. 249.368)

Nature of the Work

Library technicians and assistants support and assist professional librarians in providing information. Many work directly with the library users to explain and discuss available services. They are supervised by a librarian and have duties in either technical services or user services.

In technical services, library assistants prepare the library's materials and equipment for readers' use. For example, they may keep current files of special materials, such as newspaper clippings and pictures. They may operate and maintain audiovisual and data processing equipment, including slide projectors and tape recorders, as well as readers that magnify, project on a screen, and sometimes print out information on microfilm and microfiche cards. Library assistants also may perform many of the routine tasks involved in purchasing and processing library materials. The details of cataloging new books and other additions to the library's collection are often an important part of their job.

Library assistant checking film for damage on inspecting machine.

In user's services, library assistants furnish information on library services, facilities, and rules, and answer questions that involve simple factfinding in standard reference sources. They also assist readers in the use of catalogs and indexes to locate books and other materials. Library assistants may check out, reserve, and receive materials that users borrow. In addition, their duties include sorting and shelving, inspection and repair of books and other publications, issuing and checking library cards, issuing notices for overdue books, and related clerical work.

In many libraries, more highly trained personnel known as library technicians perform duties similar to those of assistants, but which require more technical knowledge. However, library technicians do not usually sort or shelve books or handle clerical or related tasks. Some, in addition to their regular duties, may supervise the work of others who perform the more routine work of the library.

Places of Employment

An estimated 135,000 people—four-fifths of them women—worked as library technicians and assistants in 1974. Most worked in large public libraries or in college and university libraries. Smaller numbers worked in school libraries and in medical, law, scientific, technical, and other special libraries.

In 1974, the Federal Government employed about 3,200 library technicians. These people worked chiefly in the Department of Defense and the Library of Congress, although some worked in small Federal libraries throughout the country.

Training, Other Qualifications, and Advancement

Library technicians and assistants may receive training for their work either on the job or in a formal post-high school program. Depending on the library, on-the-job programs generally require from 1 to 3 years to complete.

Junior or community colleges and technical institutes offer 2-year formal educational programs which lead to an associate of arts degree in library technology. Many people working in libraries take courses part-time to get their degree.

Junior and community college programs generally include 1 year of liberal arts courses and a year of library-related study on purposes and organization of libraries, and on procedures and processes involved in operating a library. Students learn to order and process, catalog, and circulate library materials. Some receive training in data processing as it applies to libraries. Many learn to use and maintain audiovisual materials and equipment.

In 1974, 59 institutions offered library technical assistant training. These institutions—mostly 2-year colleges—are in 23 States. Some programs teach skills for a particular type of library. Therefore, a prospective student should select a program with a knowledge of the curriculum, instructional facilities, faculty qualifications, and the kinds of jobs that graduates have found. Also, while programs may lead to an associate degree, credits earned in a library technology program may not apply toward a professional degree in library science.

A high school diploma or its equivalent is the standard requirment for both academic and on-the-job training programs. Many programs also require typing.

Library technicians and assistants should enjoy detail and have manual dexterity, verbal ability to explain procedures to library users, and numerical ability to handle circulation statistics. Jobs may require much standing, stooping, bending, and reaching.

Employment Outlook

The number of library technicians and assistants is expected to grow faster than the average for all occupations through the mid-1980's. More positions are likely to be available in large public and college and university libraries, particularly for persons who graduate from academic programs.

Factors influencing the demand for library technicians and assistants are population and school and college enrollment growth and expansion of library service. Library technicians and assistants increasingly are performing some of the routine tasks formerly done by the professional staff.

In addition to openings created by growth, many library technicians and assistants will be needed annually to replace those who die, retire, or transfer to other fields.

Earnings and Working Conditions

Salaries for library technicians and assistants vary widely depending on the size of the library or library system in which they work as well as the geographical location and size of the community. However, in general, they averaged about the same as all nonsupervisory workers in private industry, except farming.

In the Federal Government, salaries of library technicians generally ranged from $6,764 to $10,520 a year in 1974. A few earned $12,841 a year, or more.

Library technicians in government and special libraries usually work a regular 40-hour week, but persons in public libraries and college and university libraries may have schedules that include weekend and evening hours. In schools, library assistants work during regular school hours.

Most libraries provide fringe benefits such as group insurance and retirement pay. Additional benefits offered by private busi-

nesses often include educational assistance programs. Library technicians employed by the Federal Government receive the same benefits as other Federal workers.

Sources of Additional Information

For information on institutions offering programs for the training of library technicians, write:

Council of Library Technical Assistants, Department of Library Science, University of Mississippi, University, Miss. 38677.

American Library Association, Office of Library Personnel Resources, 50 East Huron St., Chicago, Ill. 60611.

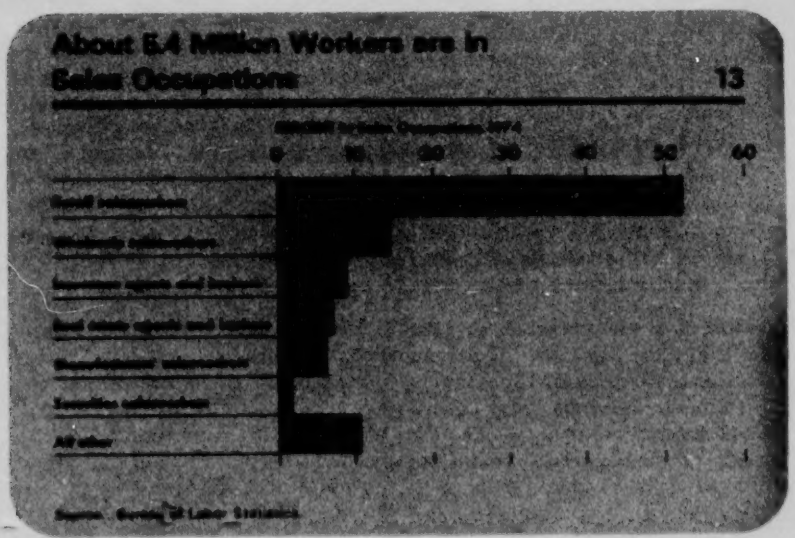
SALES OCCUPATIONS

Saleswork offers career opportunities for people who have completed high school as well as for college graduates, for those who want to travel and those who do not, and for salaried workers as well as for men and women who wish to run their own businesses.

Workers in these jobs may sell for manufacturers, service firms, wholesalers, or retailers. In 1974, over 5.4 million people were in sales occupations; almost 30 percent worked part time. The accompanying chart shows employment in the major sales occupations discussed in this section. Other statements in this section cover automotive salesworkers, automobile parts counter workers, automobile service advisors, gasoline service attendants, models, and route drivers.

Training, Other Qualifications, and Advancement

Training requirements for saleswork are as varied as the work itself. Salesworkers who sell standardized merchandise such as magazines, candy, cigarettes, and cosmetics usually are trained on the job by experienced salesclerks; in some large stores, they may attend brief training courses. The salesworker who sells complex products or services, such as electronic equipment or liability insurance, needs more education and training than most retail salesclerks. For some positions, salesworkers must be college graduates with majors in a field such as engineering. Others get the necessary technical knowledge from university or manufacturers' courses. Still others learn through years of on-the-job experience, often supplemented by home study. Thus, a real estate agent may take university extension courses; a department store beauty counselor may participate in an industry-sponsored training program; or a jewelry salesworker may learn through years of observation and study on the job.



Even in the most routine kinds of selling, a high school diploma is an asset to a beginner. Courses in business, as well as specialized courses in distributive education, are particularly good preparation.

Salesworkers must understand the needs and viewpoints of their customers and be poised and at ease with strangers. Other important attributes for selling are energy, self confidence, imagination, self-discipline, and the ability to communicate. Arithmetic skills are an asset. In almost all saleswork except retail trade, salesworkers need initiative to locate prospective customers and to plan work schedules.

Employment Outlook

Employment in sales occupations is expected to rise about as fast as the average for all occupations through the mid-1980's. In addition to jobs resulting from growth, thousands of openings will occur each year as workers die, retire, or leave the occupation for other reasons.

As employment rises, the proportion of part-time workers—already high—is likely to increase. Many part-time jobs will be in suburban shopping centers which have retail stores open several nights a week.

Further information about employment prospects for salesworkers is given in statements that follow.

AUTOMOBILE PARTS COUNTER WORKERS

(D.O.T. 289.358)

Nature of the Work

Automobile parts counter workers sell replacement parts and accessories for automobiles, trucks, and other motor vehicles. Most of them work in wholesale stores and automobile dealerships. They sell over the counter and take telephone orders for items such as piston rings, head gaskets, shock absorbers, rearview mirrors, and seat covers.

Parts counter workers for wholesalers sell parts for many makes of automobiles and trucks to independent repair shops, service stations, self-employed mechanics, and "do-it-yourselfers." Counter workers for dealers usually sell parts only for the makes of automobiles and trucks sold by the dealers. They may spend most of their time supplying parts to the dealer's mechanics.

Parts counter workers identify and locate in the stockroom items the customer needs—often only from general descriptions. By knowing parts catalogs and the layout of the stockroom they quickly can find any of several thousand items. If a customer needs a part that is not stocked, counter workers may suggest one that is interchangeable, place a special order, or refer the customer elsewhere.

Counter workers determine the prices of parts from lists, fill out sales receipts, and accept payments. When necessary they package items sold.

In addition to selling, counter workers keep catalogs and price lists up to date, replenish stock, unpack and distribute incoming shipments, record sales, and take inventories. Large firms employ stock and receiving clerks to do some of the work.

Counter workers use micrometers, calipers, fan belt measures, and other devices to measure parts for interchangeability. They also may use coil condenser testers, spark plug testers, and other equipment to find defective parts. In some firms, particularly small wholesale stores, they repair parts by using equipment such as brake riveting machines and brake drum lathes.

Places of Employment

About 75,000 persons were employed as automobile parts counter workers in 1974. Most worked for automobile dealers and parts wholesalers. Dealers typically employed one to four counter workers; many wholesalers employed more than four. Other employers include truck dealers, retail automobile parts stores, and warehouse distributors of automotive parts. Trucking companies and buslines employ counter workers to maintain stockrooms and dispense parts to mechanics who repair their fleets.

Parts counter workers are located throughout the country in dealerships and automobile parts wholesale stores. Those who work for warehouse distributors, trucking companies, and buslines are employed mainly in large cities.

Training, Other Qualifications, and Advancement

Most parts counter workers learn the trade on the job. Beginners usually are hired as parts deliverers or trainees. In some large firms, beginners start as stock or receiving clerks. Trainees gradually learn the different types of parts, the use of catalogs and price lists, and the layout of the stockroom. Although trainees may wait on customers after a few months' experience, generally about 2 years are required for a counter worker to become fully qualified.

Automobile parts counter workers should know the different types and functions of motor vehicle parts and be able to work with numbers. Employers generally prefer high school graduates for entry jobs. Courses in automobile mechanics, commercial arithmetic, merchandising, selling, and bookkeeping are helpful to young persons interested in becoming parts counter workers. Practical experience from working in a gasoline service station or automobile repair shop, or working on cars as a hobby also is helpful.

Persons considering careers as automobile parts counter workers should be neat, friendly, and tactful since they deal with the public in many cases. A good memory and the ability to write legibly and concentrate on details also are desirable.

Counter workers who have supervisory and business management ability may become parts department managers or store managers. Others may become outside sales representatives for parts wholesalers and distributors. These people call on automobile repair shops, service stations, trucking companies, and other businesses that buy parts and accessories in large quantities. Some counter workers open their own automobile parts stores.

Employment Outlook

Employment of automobile parts counter workers is expected to increase faster than the average for all occupations. Employment will rise because more parts will be needed to repair the Nation's growing number of motor vehicles.

Counter worker discusses parts order with auto mechanic.

In addition to jobs from employment growth, more than a thousand openings are expected annually to replace experienced workers who retire, die, or transfer to other occupations. The number of openings is not expected to fluctuate significantly from year to year because the demand for automobile parts, unlike some products, is not very sensitive to changing economic conditions.

Earnings and Working Conditions

Automobile parts counter workers are paid a weekly or monthly salary, or an hourly wage rate. In addition, they may receive commissions on sales. Counter workers employed by automobile dealers in 34 large cities had estimated average earnings of $4.60 an hour in late 1974, slightly higher than the average for all nonsupervisory workers in private industry, except farming.

Parts counter workers typically work 40 to 48 hours a week. Many work half a day on Saturday.

Stockrooms usually are clean and well lighted. The work is not physically strenuous, but counter workers spend much time standing or walking. They have to work rapidly when waiting on customers and answering telephone calls at the same time.

Many parts counter workers belong to unions such as: the International Association of Machinists and Aerospace Workers; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.).

Sources of Additional Information

Details about employment opportunities may be obtained from local automobile dealers and parts wholesalers, locals of the unions previously mentioned, or the local office of the State employment service.

For general information about the occupation, write to:

Automotive Service Industry Association, 230 N. Michigan Ave., Chicago, Ill. 60601.

National Automotive Parts Association, 10400 West Higgins Rd., Rosemont, Ill. 60018.

AUTOMOBILE SALESWORKERS

(D.O.T. 280.358)

Nature of the Work

Automobile salesworkers are important links between dealers and car buyers. Many sell only new or used cars. Others, particularly those employed in small dealerships, sell new and used cars, as well as trucks. (This statement does not discuss truck sales specialists.)

Automobile salesworkers spend much time waiting on customers in the showroom or used-car lot. They find out the kind of car the customer wants by asking questions and encouraging comments about cars on display. For example, one customer may be interested primarily in economy, but another may be more impressed with styling and performance. The salesworkers emphasize the points that satisfy the customers' desires and stimulate their willingness to buy. To illustrate features such as performance, ride, and handling, the salesworker invites the customer to test-drive the car.

Auto salesworker discusses new car features with customer.

Because cars are a major purchase, customers must be convinced that they are making a wise decision. Successful salesworkers can overcome the customer's hesitancy to buy, and get the order. Since closing the sale frequently is difficult for beginners, experienced salesworkers or sales managers often lend assistance. Salesworkers may quote prices and trade-in allowances, but these figures usually require the approval of the manager. Salesworkers register cars and may get license plates and arrange financing and insurance for customers.

Salesworkers approve delivery, and they answer customers' questions on subjects such as the car's controls and the maintenance warranty. Following delivery, they may contact customers to express appreciation for their business and to inquire about their satisfaction with the car. From time to time, they also may send literature to customers in order to build repeat business.

Salesworkers develop and follow leads on prospective customers. For example, they obtain names of prospects from automobile registration records and dealer sales, service, and finance records. They also can get leads from gas station operators, parking lot attendants, and others whose work brings them into frequent contact with people. Salesworkers may contact prospects by phone or mail.

Places of Employment

About 130,000 persons worked as automobile salesworkers in 1974. New-car dealers employed about four-fifths of the total, and used-car dealers employed the remainder. Although many used-car dealers employ only one salesworker, a few new-car dealers employ more than 50.

Automobile salesworkers are employed throughout the country, but most are concentrated in heavily populated areas.

Training, Other Qualifications, and Advancement

Most beginners are trained on the job by sales managers and experienced salesworkers. Many large dealers also provide several days of classroom training on how to obtain customer leads, make sales presentations, and close sales. Automobile manufacturers may furnish training manuals and other educational material. Experienced and beginning salesworkers receive continuing guidance and training from their managers, both on the job and at periodic sales meetings. They also may attend training programs offered by automobile manufacturers.

A high school diploma usually is the minimum educational requirement for beginners. Courses in public speaking, commercial arithmetic, English, merchandising, selling, business law, and psychology also provide a good background for this type of work. Previous sales experience or other work requiring contact with the public is helpful. Many persons in automobile sales, for example, previously were in furniture, appliance, or door-to-door sales. However, automobile sales managers frequently will hire inexperienced applicants who have satisfactory personal and educational qualifications.

Although age requirements for beginners vary, many employers prefer applicants who are at least in their mid- or late twenties. As a rule, however, 21 is the minimum age for beginners. Age requirements may be waived for a mature applicant.

Automobile salesworkers must be tactful, well-groomed, and able to express themselves well. Initiative and aggressiveness also are important since the number of cars sold usually depends on the number of prospective customers contacted. Because automobile salesworkers occasionally work for days without making a sale, they need self-confidence and determination to get through these slow periods.

Successful employees who have managerial ability may advance to assistant sales manager, sales manager, or general manager. Some managers and general managers open their own dealership or become partners in dealerships.

Employment Outlook

Employment of automobile salesworkers is expected to grow faster than the average for all occupations through the mid-1980's as the demand for automobiles increases. In addition to jobs resulting from employment growth, thousands of openings will occur as salesworkers retire, die, or transfer to other occupations.

Over the long run, rising population and personal incomes will lead to increased car sales, and employment of salesworkers will grow. However, employment will fluctuate from year to year because car sales are affected by changing economic conditions and consumer preferences. Therefore, opportunities for beginners will be plentiful in some years, scarce in others.

Earnings and Working Conditions

Most salesworkers are paid a commission based on the selling price of a car or the profit received by the dealer. Additional commissions may be paid when cars are financed and insured through the dealer. Although salesworkers are employed year-round, their sales, and therefore their commissions, vary from month to month. Many dealers pay a modest weekly or monthly salary so that commissioned salesworkers will have a steady income. Others advance them money against future commissions. A few dealers pay a straight salary. Dealers may guarantee beginners a modest income for a few weeks or months. Thereafter, they are paid on the same basis as the experienced staff.

Salesworkers employed by new-car dealers had estimated average weekly earnings of about $260 in 1974. Earnings varied, depending on individual ability and experience, geographic location, and dealership size. For example, salesworkers who worked for dealers that sold between 100 and 149 new vehicles annually averaged about $197 a week, while those employed by dealers that sold 1,000 cars or more averaged about $300 per week.

Earnings may fluctuate significantly from year to year due to changes in the demand for cars. In lean years, workers with poor sales records may be laid off or may quit to find better paying jobs in other fields. Many, however, return when the demand for cars improves.

Many dealers furnish their sales staffs with demonstrator cars free of charge. Others sell or lease demonstrators at a discount, often at dealer's cost. Salesworkers also receive discounts on cars bought for personal use.

Because most customers find shopping after work convenient, salesworkers frequently work evenings. In some areas, they may work Sunday and take a day off during the week. Many dealers assign salesworkers "floortime"—hours they spend in the showroom greeting customers. For example, a salesworker may be in the showroom from 9 a.m. to 3 p.m. one week, from 3 p.m. to 9 p.m. the next week, and all day on Saturdays. When not assigned to the showroom, they may spend a few hours each day delivering cars to customers and looking for new customers.

Sources of Additional Information

Details on employment opportunities may be obtained from local automobile dealers of the local office of the State employment service. For general information about the work, write to:

National Automobile Dealers Association, 2000 K St. NW., Washington, D.C. 20006.

AUTOMOBILE SERVICE ADVISORS

(D.O.T. 620.281)

Nature of the Work

Many automobile dealers and some large independent garages employ service advisors to wait on customers who bring their cars for maintenance and repairs. The service advisor, sometimes called service salesworker or service writer, confers with customers to determine their service needs and arranges for a mechanic to perform the work.

For a routine checkup, service advisors merely write the customer's requests on a repair order. However, when the customer complains of major trouble, the advisor asks about the nature of the trouble and may test drive the car. For example, if the customer says the car is difficult to start, the advisor may try to find out if this happens when the engine is cold or after it warms up. The advisor then writes a brief description of these symptoms on the repair order to help the mechanic locate the trouble. Service advisors also include the name of the customer and make of the car on the repair order. If a factory warranty covers the repairs, the engine and body numbers, mileage, and date of purchase are recorded.

If customers request, service advisors explain what repairs are needed, their approximate cost, and how long the work will take. Since this cannot always be done until mechanics have inspected the cars, service advisors may phone the customers later, give them this information, and thank them for permission to do the work. They may advise on the necessity of having work done, by pointing out that it will assure improved performance, safer operation, and prevent more serious trouble. In addition to advising customers on service needs, they may sell accessories such as air-conditioners or radios.

Service advisors give repair orders to the shop dispatcher who then figures cost of repairs and assigns work to mechanics. In some shops, advisors compute repair costs. If mechanics have questions about a repair order, they contact the advisor who wrote it. After the mechanic has finished the work, the service advisor may test drive the car to be sure the problem has been corrected.

When the customer returns for the car, the service advisor answers questions regarding the repairs and settles complaints about their cost or quality. If the car is to be returned to the shop because the customer is dissatisfied or the cost of repairs is to be adjusted, the advisor usually must get permission from the service manager. In some dealerships, the most experienced service advisors substitute for serv-

Service advisor prepares repair order for truck.

ice managers when they are absent.

Places of Employment

More than 20,000 persons worked as automobile service advisors in 1974. Most worked for large automobile dealers that employed from one to four advisors, but some worked for large independent automobile repair shops.

Training, Other Qualifications, and Advancement

Service advisors are trained on the job under the guidance of experienced service advisors and the service manager. In many shops, trainees begin by helping the service department dispatcher. They learn to route repair orders through the shop, to compute costs, and to determine the time required for different repairs. The beginner usually can become a qualified service advisor in 1 to 2 years, but learning to estimate the cost of automobile body repairs may take a longer time. In addition to on-the-job training, some advisors attend formal training programs conducted by automobile manufacturers.

For service advisor trainees, employers prefer high school graduates over 21 years of age with work experience in automobile repair or related activities. Employers usually promote persons from within their own organizations. For example, a person may apply for a job as service advisor trainee after gaining experience in the firm as a mechanic trainee or parts counter worker trainee. Some firms, however, prefer to hire fully experienced mechanics.

Because service advisors deal directly with customers, employers look for applicants who are neat, courteous, even-tempered, attentive listeners, and good conversationalists. High school and vocational school courses in automobile mechanics, commercial arithmetic, sales, public speaking, and English are helpful.

Service advisors with supervisory ability may advance to shop supervisors or to service managers. Some open their own automobile repair shops.

Employment Outlook

Employment in this small occupation is expected to increase about as fast as the average for all occupations through the mid-1980's. There will be more automobiles on the road, and they will be more complex. This will result in a need for more service advisors. In addition to the job openings resulting from employment growth, a few hundred openings will arise each year to replace experienced service advisors who retire, die, or transfer to other occupations. The number of openings is not expected to fluctuate significantly from year to year because the demand for automobile repairs is not very sensitive to changing economic conditions.

Job openings for service advisors will be concentrated in large automobile dealerships, most of which are located in metropolitan areas. In small towns, many dealers do not have enough repair business to hire service advisors; shop supervisors do the work instead.

Earnings and Working Conditions

Service advisors employed by automobile dealers in 34 large cities had estimated average earnings of $5.95 an hour in late 1974, more than one-third higher than the

average for all nonsupervisory workers in private industry, except farming.

Many service advisors are paid a salary plus commission; others are paid a straight commission. Commissions usually are based on both the cost of repairs and the price of accessories sold.

Most service advisors work 40 to 48 hours a week. They are busiest in the early morning when most customers bring their cars for repairs, and in late afternoon when they return. During these peak hours advisors may be rushed to wait on customers. Occasionally, they have to deal with disgruntled customers.

Service advisors stand much of the time and may be outdoors in all kinds of weather, but their work is not physically strenuous.

Unions that organize service advisors include the International Association of Machinists and Aerospace Workers; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffers, Warehousemen and Helpers of America (Ind.).

Sources of Additional Information

Details on employment opportunities may be obtained from local automobile dealers or repair shops; locals of the unions previously mentioned; or the local office of the State employment service.

For general information about the work of automobile service advisors, write to:

Automotive Service Industry Association, 230 N. Michigan Ave., Chicago, Ill. 60601.

Automotive Service Councils of America, Inc., 4001 Warren Blvd., Hillside, Ill. 60162.

GASOLINE SERVICE STATION ATTENDANTS

(D.O.T. 915.867)

Nature of the Work

Gasoline service station attendants help keep the Nation's 125 million motor vehicles running and in good operating condition.

Service station attendants pump gasoline, clean windshields, and offer the additional services of checking water level, oil level, and tire air pressure. They also may check the tires, fan belt, and other parts for excessive wear.

Attendants have other responsibilities besides servicing cars. They sell and install parts and accessories such as tires, batteries, fan belts, and windshield wiper blades. When a customer pays the bill, attendants either make change or prepare a charge slip. They may do minor maintenance and repair work, such as changing oil, rotating tires, fixing flats, or replacing mufflers. Some attendants, called mechanic-attendants, perform more difficult repairs. repairs.

Attendants also may keep the service areas, building, and restrooms clean and neat. In some stations, they help the station manager take inventory, set up displays, and keep business records.

If a service station provides emergency road service, attendants occasionally may drive a tow truck to a disabled car to "boost" the battery, change a flat tire, or perform other minor repairs. If more extensive repairs are needed, they tow the car back to the station.

Attendants may use simple handtools such as screwdrivers, pliers, and wrenches, and power tools such as pneumatic wrenches. Mechanic-attendants frequently use more complex equipment, such as motor analyzers and wheel alignment machines.

Places of Employment

Over 450,000 people worked as gasoline service station attendants in 1974. About one-third of these were part-time employees. In addition to attendants, more than 225,000 gasoline service station managers and owners did similar work.

Service station attendants work in every section of the country, in the largest cities, in the smallest towns, and in outlying areas.

Training, Other Qualifications and Advancement

Applicants for jobs as gasoline service station attendants should have a driver's license, a general understanding of how an automobile works, and some sales ability. They should be friendly people, able to speak well, and presenting a generally neat appearance. They also need self-confidence. Applicants should know simple arithmetic so they can make change quickly and accurately and help keep business records. They also should be familiar with local roads, highways, and points of interest in order to give directions to customers and to locate cars whose owners have called for road service.

Although completion of high school is not generally a requirement for getting an entry job, it is an advantage because it indicates to many employers that a young person can "finish a job." A high school education usually is required for service station management training programs conducted by oil companies.

Service station attendants receive most of their training on the job, although there are some formal training programs. Trainees do relatively simple work at first, such as cleaning the station, pumping gas, and cleaning windshields. Gradually, they progress to more advanced work such as doing simple maintenance work, installing accessories on cars, and helping to keep the station records. It usually takes from several months to a year

to become a fully qualified attendant.

Formal training programs for gasoline service station work are offered in many high schools around the country. In this curriculum, students in their last 2 years of high school take business education courses and work part-time in a gasoline service station, where they receive instruction in all phases of service station work.

Some attendants are enrolled in formal training program for service station managers, which are conducted by most major oil companies. These programs usually last from 2 to 8 weeks and emphasize subjects such as simple automobile maintenance, salesmanship, and business management.

Several avenues of advancement are open to service station attendants. Additional training qualifies attendants to become automobile mechanics; those having business management capabilities may advance to station manager. Many experienced station managers and automobile mechanics go into business for themselves by leasing a station from an oil company or buying their own station. Oil companies hire some service station managers as sales representatives or district managers.

Employment Outlook

Employment of gasoline service station attendants should continue to grow over the next few years. However, the extent of longrun employment growth of gasoline service station attendants is difficult to estimate. The trend toward cars with better gas mileage capabilities could eventually reduce total gasoline consumption, which might severely limit growth in this occupation over the long run. Self-service gas stations also may limit growth. However, in this occupation of many persons, thousands of job openings are expected each year to replace workers who retire, die, or transfer to other occupations.

Earnings and Working Conditions

Earnings of gasoline service station attendants vary considerably. Hourly earnings for many attendants ranged from $2 to $3 in 1974, according to the limited information available. Attendants employed in large metropolitan areas generally had higher earnings than those in small towns.

Full-time attendants work 40 hours a week or more. Work schedules may include evenings, weekends, and holidays.

Attendants work outdoors in all kinds of weather. They do considerable lifting and stooping and spend much time on their feet. Possible injuries include cuts from sharp tools and burns from hot engines. For many attendants, however, the opportunity to deal with people and the possibility of someday managing their own service stations more than offset these disadvantages. For others, the opportunity to get part-time employment is important.

Some college students have been able to work their way through school as service station attendants. Some workers also supplement their income from regular jobs by working part time as attendants.

Sources of Additional Information

For more details about work opportunities, contact local gasoline service stations or the local office of the State employment service.

INSURANCE AGENTS AND BROKERS

(D.O.T. 250.258)

Nature of the Work

Insurance agents and brokers sell policies that protect individuals and businesses against future losses and financial pressures. They may help plan financial protection to meet the special needs of a customer's family; advise about insurance protection for an automobile, home, business, or other property; or help a policyholder obtain settlement of an insurance claim.

Agents and brokers usually sell one or more of the three basic types of insurance: life, property-liability (casualty), and health. Life insurance agents, sometimes called life underwriters, offer policies that pay survivors when a policyholder dies. Depending on the policyholder's individual circumstances, a life policy can be designed to provide retirement income, funds for the education of children, or other benefits. Casualty agents sell policies that protect individual policyholders from financial losses as a result of automobile accidents, fire or theft, or other losses. They also sell industrial or commercial lines, such as workers' compensation, product liability, or medical malpractice insurance. Health insurance policies offer protection against the costs of hospital and medical care or loss of income due to illness or injury, and most life agents and casualty agents offer this type of insurance to their customers. Many agents also offer securites, such as mutual fund shares or variable annuities.

An insurance agent may be either an insurance company employee or an independent business person authorized to represent one or more insurance companies. Brokers are not under exclusive contract with any single company; instead, they place policies directly with the company that best meets a client's needs. Otherwise, agents and brokers do much the same kind of work.

They spend most of their time discussing insurance policies with prospective and existing customers. Some time must be spent in of-

ficework to prepare reports, maintain records, plan insurance programs that are tailored to prospects' needs, and draw up lists of prospective customers. Specialists in group policies may help an employer's accountants set up a system of payroll deductions for employees covered by the policy.

Places of Employment

As many as 450,000 agents and brokers sold insurance full time in 1974. In addition, thousands of others worked part time. About half of the agents and brokers specialized in life insurance; the rest, in some type of property/liability insurance. A growing number of agents offer both life and property-liability policies to their customers.

Agents and brokers are employed in cities and towns throughout the country, but most work near large population centers.

Training, Other Qualifications, and Advancement

Although many employers prefer college graduates for jobs selling insurance, most will hire high school graduates with work experience. College training may help the agent grasp the fundamentals and procedures of insurance selling more quickly. Courses in accounting, economics, finance, business law, and insurance subjects are helpful.

All agents and most brokers must be licensed in the State where they plan to sell insurance. In most States, licenses are issued only to applicants who pass written examinations covering insurance fundamentals and the State insurance laws. Agents who plan to sell mutual fund shares and other securities also must be licensed by the State. New agents usually receive training at insurance company home offices or at the agencies where they will work. Beginners sometimes attend company-sponsored classes to prepare for examinations. Others study on their own and accompany experienced salesworkers when they call on prospective clients.

Agents and brokers can broaden their knowledge of the insurance business by taking courses at colleges and universities and attending institutes, conferences, and seminars sponsored by insurance organizations. The Life Underwriter Training Council (LUTC) awards a diploma in life insurance marketing to agents who successfully complete the Council's 2-year life program. They also offer courses in health insurance and equity products. As agents or brokers gain experience and knowledge, they can qualify for the Chartered Life Underwriter (CLU) designation by passing a series of examinations given by the American College of Life Underwriters. In much the same way, a property-liability agent can qualify for the Chartered Property Casualty Underwriter (CPCU) designation by passing a series of examinations given by the American Institute for Property and Liability Underwriters, Inc. The CLU and CPCU designations are recognized marks of achievement in their respective fields.

Agents and brokers should be enthusiastic, self-confident, and able to communicate effectively. Because agents usually work without supervision, they need initiative to locate new prospects. For this reason, many employers seek people who have been successful in other jobs.

Insurance agents who show unusual sales ability and leadership may become a sales manager in a district office or assume a managerial job in a home office. A few agents may advance to top posi-

tions as agency superintendents or company vice-presidents. Many who have built up a good clientele prefer to remain in saleswork. Some, particularly in the property-liability field, eventually establish their own independent agencies or brokerage firms.

Employment Outlook

Employment of insurance agents and brokers is expected to grow about as fast as the average for all occupations through the mid-1980's as the volume of insurance sales continues to expand. Many additional jobs will open as agents and brokers die, retire, or leave their jobs to seek other work. Due to the competitive nature of insurance selling, beginners often leave their jobs because they have been unable to establish a sufficiently large clientele. Therefore, opportunities should be quite favorable for ambitious people who enjoy saleswork.

Future demand for agents and brokers depends on the volume of insurance sales. Volume should increase rapidly over the next decade as a larger proportion of the population enters the period of peak earnings and family responsibilities. Life insurance sales should grow as more families select policies designed to provide educational funds for their children and retirement income. Rising incomes also should stimulate the sale of equity products such as mutual funds, variable annuities, and other investments. Sales of property-liability insurance should rise as more consumer purchases are insured and as commercial coverages, such as product liability and workers' compensation, are expanded.

However, employment of agents and brokers will not keep pace with the rising level of insurance sales because more policies will be sold to groups and by mail. Also, agents should be able to handle more business as computers relieve them of time-consuming clerical tasks.

Earnings and Working Conditions

Beginners in this occupation often are guaranteed moderate salaries or advances on commissions while they are learning the business and building a clientele. Thereafter, most agents are paid a commission. The size of the commission depends on the type and amount of insurance sold, and whether the transaction is a new policy or a renewal. After a few years, an agent's commissions on new policies and renewals may range from $10,000 to $20,000 annually. A number of established and highly successful agents and brokers earn more than $30,000 a year.

Agents and brokers generally pay their own automobile and traveling expenses. In addition, those who own and operate independent businesses must pay office rent, clerical salaries, and other operating expenses out of their earnings.

Although insurance agents usually are free to arrange their own hours of work, they often schedule appointments during evenings and weekends for the convenience of clients. Some agents work more than the customary 40 hours a week. (See the statement on the Insurance Industry for more information about work in life and property-liability companies.)

Sources of Additional Information

General occupational information about insurance agents and brokers is available from the home office of many life and property-liability insurance companies. Information on State licensing requirements may be obtained from the department of insurance at any State capital.

Information about a career as a life insurance agent also is available from:

Institute of Life Insurance, 227 Park Ave., New York, N.Y. 10017.

Life Insurance Marketing and Research Association, 170 Sigourney St., Hartford, Conn. 06105.

The National Association of Life Underwriters, 1922 F St., NW., Washington, D.C. 20006.

For career information on property/liability agents, contact:

Insurance Information Institute, 110 William St., New York, N.Y. 10038.

National Association of Insurance Agents, Inc., 85 John St., New York, N.Y. 10038.

MANUFACTURERS' SALESWORKERS

(D.O.T. 260. through 298.458)

Nature of the Work

Practically all manufacturers—whether they make computers or can openers—employ salesworkers. Manufacturers' salesworkers sell mainly to other businesses—factories, railroads, banks, wholesalers, and retailers. They also sell to hospitals, schools, libraries, and other institutions.

Most manufacturers' salesworkers sell nontechnical products. They must be well informed about their firms' products and also about the special requirements of their customers. When salesworkers visit firms in their territory, they use an approach adapted to the particular line of merchandise. A salesworker who handles crackers or cookies, for example, emphasizes the wholesomeness, attractive packaging, and variety of these products. Sometimes salesworkers promote their products by displays in hotels and conferences with wholesalers and other customers.

Salesworkers who deal in highly technical products, such as electronic equipment, often are called sales engineers or industrial salesworkers. In addition to having a thorough knowledge of their firms' products, they must be able to help prospective buyers with technical problems. For example, they may try to determine the proper materials and equipment for a firm's manufacturing process.

Manufacturers' salesworker takes order for camera equipment from photo buyer in a department store.

They then present this information to company officials and try to negotiate a sale. Often, sales engineers work with the research-and-development departments of their own companies to devise ways to adapt products to a customer's specialized needs. Salesworkers who handle technical products sometimes train their customers' employees in the operation and maintenance of new equipment, and make frequent return visits to be certain that it is giving the desired service.

Although manufacturers' salesworkers spend most of their time visiting prospective customers, they also do paperwork including reports on sales prospects or customers' credit ratings. In addition, they must plan their work schedules, draw up lists of prospects, make appointments, handle some correspondence, and study literature relating to their products.

Places of Employment

Almost 380,000 people—10 percent of them women—were manufacturers' salesworkers in 1974. About 21,000 were sales engineers. Some work out of home offices, often located at manufacturing plants. The majority, however, work out of branch offices, usually in big cities near prospective customers.

More salesworkers are employed by companies that produce food products than by any other industry. Large numbers also work in the printing and publishing, chemicals, fabricated metal products, and electrical and other machinery industries. Most sales engineers work for companies that produce heavy machinery, transportation equipment, fabricated metal products, and professional and scientific instruments.

Training, Other Qualifications, and Advancement

Although high school graduates can be successful manufacturers' salesworkers, college graduates are preferred as trainees.

Manufacturers of nontechnical products often hire college graduates who have a degree in liberal arts or business administration. Some positions, however, require specialized training. Drug Salesworkers usually need training at a college of pharmacy. Manufacturers of electrical equipment, heavy machinery, and some types of chemicals prefer to hire college-trained engineers or chemists. (Information on chemists, engineers, and others with the technical training suitable for work as manufacturers' salesworkers is given eleswhere in the *Handbook*.)

Beginning salesworkers take specialized training before they start on the job. Some companies, especially those that manufacture complex technical products, have formal training programs that last 2 years or longer. In some of these programs, trainees rotate among jobs in several departments of the plant and office to learn all phases of production, installation, and distribution of the product. Other trainees take formal class instruction at the plant, followed by on-the-job training in a branch office under the supervision of field sales managers.

A pleasant personality and appearance, and the ability to meet and get along well with many types of people are important. Because salesworkers may have to walk or stand for long periods or carry product samples, some physical stamina is necessary. As in most selling jobs, arithmetic skills are an asset.

Sales representatives who have good sales records and leadership ability may advance to sales supervisors, branch managers, or district managers. Those with managerial ability eventually may advance to sales manager or other executive positions; many top executive jobs in industry are filled by people who started as salesworkers.

Because of frequent contact with business people in other firms,

salesworkers often transfer to other jobs. Some go into business for themselves as manufacturers' agents selling similar products of several manufacturers. Other experienced salesworkers find opportunities in advertising and marketing research.

Employment Outlook

Persons with sales ability should find the best opportunities for jobs as manufacturers salesworkers over the next 10 years. Although thousands of sales openings will arise each year because of employment growth and the need to replace experienced workers who leave their jobs, manufacturers are expected to be selective in hiring. They will look for ambitious people who are well trained and temperamentally suited for the job.

Employment growth in this field is expected to be slower than the average for all occupations, chiefly because of the trend toward wholesale distribution. Some growth will occur, however, because of the rising demand for technical products and the resulting need for trained salesworkers. In addition, industrial firms, chain stores, and institutions that purchase large quantities of goods at one time frequently buy directly from the manufacturer. The need for salesworkers will increase as manufacturers emphasize sales activities to compete for the growing number of these valuable accounts.

Earnings and Working Conditions

According to the limited information available, salaries for beginning salesworkers averaged about $9,000 a year in 1974, exclusive of commissions and bonuses. The highest starting salaries generally were paid by manufacturers of electrical and electronic equipment, construction materials, hardware and tools, and scientific and precision instruments.

Some manufacturing concerns pay experienced salesworkers a straight commission, based on their dollar amount of sales; others pay a fixed salary. The majority, however, use a combination of salary and commission, salary and bonus, or salary, commission, and bonus. Commissions vary according to the salesworkers' efforts and ability, the commission rate, location of their sales territory, and the type of product sold. Bonus payments may depend on individual performance, on performance of all salesworkers in the group or district, or on the company's sales. Some firms pay annual bonuses; others offer bonuses as incentive payments on a quarterly or monthly basis. In general, the earnings of manufacturers' salesworkers are higher than the average for all nonsupervisory workers in private industry, except farming.

Some manufacturers' salesworkers have large territories and do considerable traveling. Others usually work in the neighborhood of their "home base." When on business trips, salesworkers are reimbursed for expenses such as transportation and hotels. Some companies provide a car or pay a mileage allowance to salesworkers who use their own cars.

Manufacturers' salesworkers call at the time most convenient to customers and may have to travel at night or on weekends. Frequently, they spend evenings writing reports. However, some plan their schedules for time off when they want it. Most salesworkers who are not paid a straight commission receive 2 to 4 weeks' paid vacation, depending on their length of service. They usually share in company benefits, including life insurance, pensions, and hospital, surgical, and medical benefits.

Sources of Additional Information

For more information on the occupation of manufacturers' salesworker, write:

Sales and Marketing Executives International, Student Education Division, 380 Lexington Ave., New York, N.Y. 10017.

MODELS

(D.O.T. 297.868 and 961.868)

Nature of the Work

Selling a product is always easier if an attractive man or woman is shown using it. In magazine advertisements and television commercials models can be seen posing with a wide variety of products, including cars, soft drinks, and perfume. Most models, however, are used to show the latest in fashion designs and cosmetics.

Models usually specialize in either live or photographic work. *Fashion models* generally work before an audience, modeling the creations of well-known designers at fashion shows. While the announcer describes what they are wearing, they walk past customers and photographers and point out special features of the design. On some jobs they may stop to tell individual customers a garment's price and style number.

Fashion models who work for clothing designers, manufacturers, and distributors are called *showroom* or *wholesale models*. When new spring or fall designs are being shown to prospective buyers, these models are extremely busy. During slack times, however, they may have some general office duties, such as typing or filing.

Some *informal models* work in department stores and custom salons where the pace is more leisurely than in showrooms. Others demonstrate new products and services at manufacturers' exhibits and trade shows.

Photographic models usually are hired to pose for a particular assignment. Although most model clothes

and cosmetics, they often pose with other merchandise as well. In addition to fashion and photographic work, some models pose for artists or sculptors, or work in films or television.

Places of Employment

About 9,000 models were employed in 1974, most of them women. Clothing manufacturers, designers, and wholesalers employ the largest number of models. In New York City's garment district, hundreds of firms each employ one or two permanent models to show their latest fashion designs to prospective retail buyers. Many models work on a free-lance basis, however, and either obtain assignments through a modeling agency or, in some cases, seek clients themselves. Advertising agencies, retail stores, magazines, and photographers almost always employ freelance models for their fashion articles or advertisements.

Modeling jobs are available in nearly all urban areas, but most jobs are in New York City because it is the center of the fashion industry. Chicago and Los Angeles are two other cities with many jobs for models.

Training, Other Qualifications, and Advancement

The most important asset for a model is a distinctive and attractive physical appearance. Advertisers and clothing designers hire models who have the right "look" for their product and a face or style that will be remembered. To develop an individual style, many models attend a modeling school where they learn to style their hair, walk and stand gracefully, pose in front of a camera, and apply makeup. Modeling agencies also provide this training, but normally accept only the most promising beginners.

Female models must be at least 5 feet 7 inches tall and weigh no more than 120 pounds. Male models must be 6 feet tall and wear a size 40 suit. Size requirements are quite rigid because manufacturers' and designers' samples are standard and models must fit the clothes without alteration.

Photographic models usually are thinner than fashion models because the camera adds at least 10 pounds to a person's appearance. In addition, they must have fine, regular features and good teeth and hands.

There are no educational requirements for models; some have completed high school and others have had college training. Courses in drama, dancing, art, and fashion design are useful because they can develop poise and a sense of style.

Models should enjoy working with people and must be able to withstand the pressures of competition, tight schedules, and quick changes. Physical stamina is important because models are on their feet most of the time and must sometimes assume rather awkward positions when posing for photographers.

Many beginners get their first job through the modeling school they attended. All agencies find jobs for their models. Usually, they require their models to obtain a portfolio of photographs of themselves in various styles and poses which the agency can show to prospective clients. Some department stores hold auditions that give inexperienced models a chance to model at a fashion show and perhaps obtain other jobs if they do well.

In addition, many sales jobs in department stores provide useful experience in selecting and coordinating fashions, experimenting with makeup, and occasional modeling. Sometimes a model can gain experience by working in fashion shows given by local community organizations.

Modeling can be a stepping stone to other jobs in the fashion field, such as staff editor of a fashion magazine, consultant for a cosmetic firm, or fashion coordinator for a department store. Some models take courses in art and design and may become fashion illustrators or designers. A few models who work in television commercials become actors or actresses.

Employment Outlook

Although employment of models is expected to increase faster than the average for all occupations through the mid-1980's, competition for the available jobs will be keen. The glamour of modeling attracts many more persons than are needed in the occupation.

Rising advertising expenditures and sales of clothing and accessories will cause the demand for both photographic and fashion models to increase. Most job openings, however, will result from the need to replace models who have left the occupation. Many models have to retire when they lose their youthful appearance because most employers prefer younger models. Others leave the occupation because their particular "look" goes out of style or becomes associated with an outdated product.

Earnings and Working Conditions

A model's earnings depend on the number and length of assignments he or she receives. Although a few top models earn as much as business executives, most earn far less. According to the limited information available, fashion models working full time for manufacturers or wholesalers earned from $125 to $200 a week in 1974. Models working for New York City retail stores were paid from $110 to $200 a week, and those working outside of New York from $80 to $140.

Free-lance models are paid a fee for their work. If they are registered with an agency, they pay a commission for the services it provides. In 1974, free-lance models working in fashion shows earned an average fee of $50 an hour. Those in New York earned as much as $75 an hour. These rates are misleading, however, because many models, especially beginners, work only a few hours each week and spend a great deal of their time auditioning for prospective clients. Although photographic modeling often pays well, models usually must provide their own accessories, such as wigs and hairpieces, and pay for their transportation. Occasionally, a model must buy a complete outfit in order to get a particular job.

Models appearing in television commercials earn at least $126 for a job as an extra, and about $165 for one as a principal character; they also receive additional income each time the commercial is rerun. Television models must be members of the American Federation of Television and Radio Artists or the Screen Actors Guild, Inc.

Models sometimes must work under uncomfortable conditions, posing in a swimsuit in the middle of winter, for example. The work can also affect their personal lives because models must always look fresh and well-rested for the camera and may have to limit evenings out with friends. In addition, a female model must spend part of each night on beauty care, and sometimes has to prepare her clothing and accessories for the next day's assignments.

Sources of Additional Information

Employers of models such as magazines and newspapers may be able to recommend reputable modeling agencies or schools.

A list of approved modeling schools is available from individual State departments of education. Write the directors of particular modeling schools for catalogs describing their programs, entrance requirements, and tuition costs.

REAL ESTATE SALESWORKERS AND BROKERS

(D.O.T. 250.358)

Nature of the Work

Real estate salesworkers and brokers represent property owners in selling or renting their properties. They also are called real estate agents or, if they are members of the National Association of Realtors, "realtors" or "realtor associates."

Brokers are independent business people who not only sell real estate, but also rent and manage properties, make appraisals, and develop new building projects. In closing sales, brokers usually arrange for loans to finance the purchases, for title searches, and for meetings between buyers and sellers, when details of the transaction are agreed upon and the new owners take possession. Brokers also must manage their own offices, advertise the properties they list, and handle other business operations. Some combine other types of work such as selling insurance or practicing law with their real estate business.

Salesworkers or agents work for brokers. They show and sell real estate, handle rental properties, and obtain "listings" (owner agreements to place properties for sale with the firm). Because obtaining listings is an important job duty, salesworkers may spend much time on the telephone exploring leads gathered from advertisements and personal contacts. They also answer inquiries about properties over the telephone.

A worker who sells real estate or handles rental properties often must leave the office to call on prospects and drive them to inspect properties for sale. When a number of houses are for sale in a new development, the agent may operate from a model home.

Most real estate salesworkers and brokers sell residential property. A few, usually in large firms, specialize in commercial, industrial, or other types of real estate. Each specialty requires knowledge of that particular type of property. Selling or leasing business property, for example, requires an understanding of leasing practices, business trends, and location needs. Agents who sell or lease industrial properties must know about transportation, utilities, and labor supply. To sell residential properties, the agent must know the

location of schools, churches, shopping facilities, and public transportation. Familiarity with tax rates and insurance coverages also is important.

Places of Employment

Nearly 400,000 persons sold real estate full time in 1974; many others sold on a part-time basis. The number of people licensed to sell totaled about 1.4 million in 1974, according to the National Association of Real Estate License Law Officials.

Most real estate salesworkers work for small establishments; some, particularly in urban areas, work for large firms with several offices. A few sales agents are employed by builders to sell new homes in a particular development. Real estate is sold in all areas, but employment is concentrated in large urban areas and in smaller but rapidly growing communities.

Training, Other Qualifications, and Advancement

Real estate salesworkers and brokers must be licensed in every State and in the District of Columbia. All States require prospective agents to pass written tests. The examination—more comprehensive for brokers than for salesworkers—includes questions on basic real estate transactions and on laws affecting the sale of property. A majority of States require candidates for a broker's license to have a specified amount of experience in selling real estate or the equivalent in related experience or education (generally 1 to 3 years). State licenses usually can be renewed annually without reexamination.

Employers prefer applicants with at least a high school education. As real estate transactions have become more complex, many of the large firms have turned to college graduates to fill sales positions. Most agents have some college training and the number of college graduates has risen substantially in recent years. However, many employers consider personality traits as important as academic training. They look for applicants who possess such positive characteristics as a pleasant personality, honesty, and a neat appearance. Maturity, tact, and enthusiasm for the job are required in order to motivate prospective customers in this keenly competitive field. Agents also should have a good memory for names and faces and business details such as taxes, zoning regulations, and local land-use laws.

Young men and women interested in beginning jobs as real estate salesworkers often apply in their own communities, where their knowledge of local neighborhoods is an advantage. The beginner usually learns the practical aspects of the job under the direction of an experienced agent.

Many firms offer formal training programs for both beginners and experienced salesworkers. About 360 universities, colleges, and junior colleges offer courses in real estate. At some, a student can earn an associate's or bachelor's degree with a major in real estate; several offer advanced degrees. Many local real estate boards that are members of the National Association of Realtors sponsor courses covering the fundamentals and legal aspects of the field. Advanced courses in appraisal, mortgage financing, and property development and management also are available through various National Association affiliates.

Trained and experienced salesworkers can advance in many large firms to sales or general manager. Licensed brokers may open their own offices. Training and experience in estimating property value can lead to work as a real estate appraiser, and people familiar with operating and maintaining rental properties may specialize in property management. Those who gain general experience in real estate, and a thorough knowledge of business conditions and property values in their localities, may enter mortgage financing or real estate counseling.

Employment Outlook

Employment of real estate salesworkers and brokers is expected to rise about as fast as the average for all occupations in order to satisfy a growing demand for housing and other properties. In addition to opportunities that result from this growth, several thousand openings will occur each year as employees die, retire, or leave for other reasons. Replacement needs are high, because a relatively large number of people retire from the real estate business every year. Moreover, many beginners transfer to other work after a short time selling real estate.

The favorable outlook for employment in this field will stem primarily from increased demand for home purchases and rental units. Shifts in the age distribution of the population over the next decade will result in a larger number of young adults with careers and family responsibilities. This is the group that traditionally makes the bulk of home purchases. As their incomes rise, these families also can be expected to purchase larger homes and vacation properties. During periods of declining economic activity and tight credit, the volume of sales and the resulting demand for salesworkers usually declines. During these periods, the number of persons seeking sales positions may outnumber openings. Over the long run, however, the outlook for salespeople is favorable.

Many job opportunities should occur for both college graduates and mature workers transferring from other kinds of saleswork. This field is likely to remain highly com-

petitive and prospects will be best for well-trained, ambitious people who enjoy selling. The proportion of part-time real estate salesworkers may decline, however, as State licensing requirements change and agents need more specialized knowledge to handle real estate transactions.

Earnings and Working Conditions

Commissions on sales are the main source of earnings—very few real estate agents work for a salary. The rate of commission varies according to the type of property and its value; the percentage paid on the sale of farm and commercial properties or unimproved land usually is higher than that paid for selling a home.

Commissions may be divided among several salespersons in a real estate firm. The person who obtains the listing often receives a part when the property is sold; the broker who makes the sale either gets the rest of the commission, or else shares it with the agent who handles the transaction. Although an agent's share varies greatly from one firm to another, often it is about half of the total amount received by the firm.

Earnings of full-time real estate agents generally range between $12,000 and $20,000 a year, according to the limited data available. Beginners usually earn less. Many experienced real estate salesworkers earn $30,000 or more a year. Full-time agents and brokers earn nearly three times as much as average earnings for all nonsupervisory workers in private industry, except farming.

Income usually increases as an agent gains experience, but individual ability, economic conditions, and the type and location of the property also affect earnings. Salesworkers who are active in community organizations and local real estate boards can broaden their contacts and increase their earnings. A beginner's earnings often are irregular because a few weeks or even months may go by without a sale. Although some brokers allow a salesworker a drawing account against future earnings, this practice is not usual with new employees. The beginner, therefore, should have enough money to live on until commissions increase.

Brokers provide office space, but salesworkers generally furnish their own automobiles. Agents and brokers often work in the evenings and during weekends to suit the convenience of customers. Some firms, especially the large ones, furnish group life, health, and accident insurance.

Sources of Additional Information

Details on licensing requirements for real estate salesworkers and brokers are available from most local real estate organizations or from the real estate commission or board located in each State capital. Many States can furnish manuals helpful to applicants who are preparing for the required written examinations.

For more information about opportunities in real estate work, as well as a list of colleges and universities offering courses in this field, contact:

National Association of Realtors, 155 E. Superior St., Chicago, Ill. 60611.

RETAIL TRADE SALESWORKERS

(D.O.T. 260. through 290.877)

Nature of the Work

The success of any retail business depends largely on its salesworkers. Courteous and efficient service from behind the counter or on the sales floor does much to satisfy customers and build a store's reputation. Even though contact with customers is a part of all sales jobs, the duties, skills, and responsibilities of salesworkers are as different as the kinds of merchandise they sell.

In selling items such as furniture, electrical appliances, or clothing, the salesworker's primary job is to create an interest in the merchandise. The salesworker may answer questions about the construction of an article, demonstrate its use, and show various models and colors. In some stores, special knowledge or skills may be needed to sell the merchandise. In a pet shop, for example, the salesworker should know about the care and feeding of animals. People who sell standardized articles, such as many items in hardware and drugstores, often do little more than take payments and wrap customers' purchases. (In supermarkets and some drugstores, cashiers wrap or bag purchases, receive payments, and make change. See statement elsewhere in the *Handbook* on Cashiers.)

In addition to selling, most retail salesworkers make out sales or charge slips, receive cash payments, and give change and receipts. They also handle returns and exchanges of merchandise and keep their work areas neat. In small stores, they may help order merchandise, stock shelves or racks, mark price tags, take inventory, and prepare displays. (Route drivers, who sell bread, milk, and other products directly to customers on a regular route, are discussed under Sales Occupations elsewhere in the *Handbook*.)

Places of Employment

In 1974, about 2.8 million salesworkers—three-fifths of them women—were employed in retail businesses. They worked in stores ranging from the small drug or grocery store that employs one part-time salesclerk to the giant de-

partment store that has hundreds of salesworkers. They worked also for door-to-door sales companies and mail-order houses. The largest employers of retail trade salesworkers are department stores and those selling general merchandise, apparel and accessories, and food.

Although sales jobs are found in almost every community, most salesworkers are employed in large cities and nearby suburban areas.

Training, Other Qualifications, and Advancement

Employers prefer high school graduates for sales jobs. Subjects such as commercial arithmetic and merchandising provide a good background for many selling positions. Some high schools have distributive education programs that offer courses in principles of retail selling; many give students a chance to gain practical experience working part time in local stores. Such part-time selling experience may be helpful in getting a full-time job.

Persons interested in sales jobs should apply to the personnel offices of large retail stores, where they are likely to be interviewed and, in some cases, given an aptitude test. Employers prefer those who enjoy working with people and have the tact to deal with different personalities. Among other desirable characteristics are an interest in saleswork, a pleasant personality, a neat appearance, and the ability to communicate clearly. Also, prospective salesworkers should be healthy since they must stand for long periods.

In many small stores, an experienced employee or the proprietor instructs newly hired sales personnel in making out sales slips and operating the cash register. In larger stores, training programs are likely to be more formal, and to include specialized training in selling certain products.

Retail selling remains one of the few fields in which able employees may advance to executive jobs regardless of educational background. Although large retail businesses generally hire college graduates as management trainees, this is not the only way to move into jobs at the management level. Some salesworkers are promoted to jobs as buyers, department managers, or store managers. Others, particularly in large stores, may advance to administrative work in areas such as personnel or advertising. Opportunities for advancement are limited in small stores where one person, often the owner, does most managerial work. Retail selling experience may be an asset in qualifying for saleswork with wholesalers or manufacturers.

Employment Outlook

Retail trade selling will continue to be an excellent source of job opportunities for high school graduates. In addition to full-time jobs, there will be many opportunities for part-time workers, as well as for temporary workers during peak selling periods such as the Christmas season. Prospects are expected to be good because retail selling is a large occupation and turnover is high. Most openings will occur as experienced full and part-time salesworkers leave their jobs.

Employment of salesworkers in retail trade is expected to increase about as fast as the average for all occupations through the mid-1980's, as the volume of sales rises and stores continue to remain open longer. However, sales employment will increase more slowly than the volume of sales as self-service—already the rule in most foodstores—is extended to drug, variety, and other kinds of stores. At the same time, rising income levels may increase the demand for "big ticket items," such as television sets, that require the salesworker to spend a good deal of time with each customer.

Earnings and Working Conditions

In 1974, salesworkers starting in routine jobs where they did little more than "wait on" customers generally earned $1.90 or $2 an

hour, the Federal minimum wage. In stores where selling is more important, starting salaries were sometimes higher. Salaries usually are lower in rural than in urban areas.

Experienced salesworkers, including those whose pay scales are determined by union contracts, often earn $3 to $6 an hour or more. Many are paid a straight salary. In addition to their salary, some salesworkers receive commissions—that is, a percentage of the sales they make. Still others are paid a straight commission alone. Those paid only by commission may find their earnings greatly affected by ups and downs in the economy. Earnings are likely to be highest in jobs that require special skill in dealing with customers, or technical knowledge of the merchandise sold. Among the highest paid are people who sell automobiles, major appliances, and furniture. On the average, retail trade salesworkers earn about as much as nonsupervisory workers in private industry, except farming.

Salesworkers in many retail stores may buy merchandise at a discount, often from 10 to 25 percent below regular prices. This privilege sometimes is extended to the employee's family. Some stores, especially the large ones, pay all or part of the cost of such employee benefits as life insurance, health insurance, and a pension.

Many full-time salesworkers have a 5-day, 40-hour week, although in some stores the standard workweek is longer. Because Saturday is a busy day in retailing, employees usually work that day and have another weekday off. Longer than normal hours may be scheduled before Christmas and during other peak periods, and employees who work overtime receive additional pay or an equal amount of time off during slack periods. Some, especially those employed by stores in suburban shopping centers, regularly work one evening a week or more.

Part-time salesworkers generally work during the store's peak hours of business—daytime rush hours, evenings, and weekends.

Salesworkers in retail trade usually work in clean, well-lighted places and many stores are air-conditioned. Some jobs, however, require work outside the store. A kitchen equipment salesworker may visit prospective customers at their homes, for example, to help them plan renovations, and a used-car salesworker may spend much time at an outdoor lot.

Sources of Additional Information

Information about careers in retail sales is available from:

The National Retail Merchants Association, 100 W. 31st St., New York, N.Y. 10001.

Additional information on careers in retailing may be obtained from the personnel offices of local stores; from State merchants' associations; or from local unions of the Retail Clerks International Association.

ROUTE DRIVERS

(D.O.T. 292.358)

Nature of the Work

Route drivers use light trucks on assigned routes to sell and deliver goods or provide services. They are sometimes known as driver-salesworkers or route-salesworkers. They must, through their selling ability, increase sales to existing customers and obtain new business by finding additional customers within their territories.

Route drivers' duties vary according to the industry in which they are employed, the type of route they have (retail or wholesale), and the company employing them. Some specific examples, however, may describe in a general way what most route drivers do.

On a typical day, laundry and drycleaning route drivers begin by picking up cleaned garments at the processing plant. They deliver the clean garments to customers' homes and pick up any dirty clothing. Drivers mark the dirty clothes so that they can be returned to the owner. Sometimes, they make notes of the type of stains to be removed or of special processes to be used, such as waterproofing. After delivering the clean garments, drivers present each customer with an itemized bill and collect the amount of money due.

Although all route drivers must be able to get along well with people, it is particularly important for the drycleaning and laundry route drivers. Their reactions to complaints and requests for special services may be the difference between getting more business or losing customers. Periodically, they stop at homes along their routes to try to sell their company's services.

Wholesale bakery route drivers deliver bread and other baked goods to grocery stores. Before starting on the route they check to see whether the proper variety and quantity of products have been loaded. At each of the 10 to 50 grocery stores along their route, they carry the orders of bread and other baked goods into the store and arrange them on the display racks. Together with the store owner or manager, bakery route drivers check the merchandise delivered and prepare a bill. They also credit the store for the value of the stale items left over from the previous delivery.

Bakery route drivers prepare a list of products they plan to deliver the next day. These lists are estimates of the amount and variety of baked goods that will be sold by the grocery stores. From time to time, they visit grocers along the route who are not customers and try to get orders from them.

Vending machine route drivers make certain the machines on their routes are stocked with merchandise and in good working order. At each location, they check the items remaining in machines and remove the money deposited in the cash boxes. Drivers also check vending machines to see that merchandise and change are dispensed properly, and make minor adjustments to machines that are broken. In addition, they clean machines and replace stock. Route drivers keep records of the merchandise placed in each machine and the money removed. They may try to find new locations for vending machines by visiting stores, factories, and other businesses along their routes.

Places of Employment

About 190,000 route drivers worked for a wide variety of businesses in 1974. Since most are employed by companies that distribute food products or provide personal services, they work in small towns as well as in large cities. The greatest concentration of employment is in dairies, bakeries, food and beverage distribution firms, and drycleaning plants in large cities.

Training, Other Qualifications, and Advancement

Route drivers must be good drivers, and must have sales ability. To get people to buy, they must have a thorough knowledge of the product or service they sell and a persuasive personality. Other important sales qualifications are a pleasant voice, ability to speak well, and a neat appearance. They also need self-confidence, initiative, and tact.

Route drivers must be able to work without direct supervision, do simple arithmetic, and write legibly. In most States, a route driver is required to have a chauffeur's license, which is a commercial driving permit. Information on this license can be obtained from State motor vehicle departments.

Most employers prefer their route drivers to be high school graduates. Route drivers who handle a great deal of money may have to be bonded.

Most companies give their new employees on-the-job training which varies in length and thoroughness, and many large companies have classes in sales techniques.

School-and-work programs in retail and wholesale merchandising are helpful to a person interested in entering this occupation. High school courses in sales techniques, public speaking, driver training, bookkeeping, and business arithmetic are helpful. Valuable experience may be obtained as a sales clerk in a store or in some other type of selling job.

Some people enter this occupation as *route driver helpers* (D.O.T. 292.887). Helpers receive on-the-job training from drivers. When openings occur, they may be promoted to drivers. Helpers, however, are not likely to be employed in the dairy or vending machine industries.

Route drivers may be promoted to route or sales supervisor, but these jobs are relatively scarce. Advancement usually is limited to moving from a retail to a wholesale route, where earnings generally are higher. However, some drivers obtain better-paying sales jobs as a result of their experience in route selling.

Employment Outlook

The total number of route drivers is expected to change little through the mid-1980's. However, some openings for new workers will arise as experienced route drivers transfer to other fields of work, retire, or die. Applicants with sales experience and good driving records have the best chance of being hired.

Although total employment is expected to remain about the same, employment trends will differ for various types of routes. For example, employment of laundry and drycleaning route drivers is expected to decline as more people take their clothes to neighborhood stores for quicker, cheaper service, or use clothes made from material which can be washed easily at home.

On the other hand, employment of vending machine route drivers is expected to grow due to the greater use of automatic food service in factories, schools, hospitals, and other locations where machines are the only practical way of providing food and beverages.

Earnings and Working Conditions

Most route drivers receive a minimum salary plus a percent of the sales they make. Thus, earnings are determined largely by their selling ability and initiative. According to limited information available in 1974, route drivers in the dairy and baking industries were guaranteed weekly wages of $90 to $125 plus commissions on sales. Many of these workers earned more than $200 a week. Wholesale route drivers who make deliveries to stores usually earn more than those who make deliveries to homes.

The number of hours worked by route drivers varies. Some work only about 30 hours a week; others may work 60 hours or more depending upon whether they have well-established routes or are trying to build up new ones, and how ambitious they are. The number of hours worked may be limited by a union contract, although many contracts specify merely the earliest hour that work may begin and the latest quitting time. The hours also may vary with the season. During the spring-cleaning season, for example, drycleaning route drivers

may work about 60 hours a week, but in winter they may work less than 30 hours.

Many companies require route drivers to wear uniforms. Some employers pay for the uniforms and for keeping them clean. Route drivers do not work under close supervision. Within certain broad limits, they decide how rapidly they will work and where and when they will have a lunch or rest period. On the other hand, route drivers have to make deliveries in bad weather and do a great deal of lifting, carrying, and walking. They also may have to work unusual hours. For example, drivers who have retail milk routes generally start to work very early in the morning.

Many route drivers, particularly those who deliver bakery and dairy products, are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.) Some belong to the unions which represent the plantworkers of their employers.

Sources of Additional Information

For details on route driver employment opportunities, contact local employers, such as bakeries and vending machine companies, or the local office of the State employment service.

SECURITIES SALESWORKERS

(D.O.T. 251.258)

Nature of the Work

When investors buy or sell stocks, bonds, or shares in mutual funds, they call on securities salesworkers to put the "market machinery" into operation. Both the individual who invests a few hundred dollars and the large institution with millions to invest need such services. Often these workers are called *registered representatives, account executives,*or *customers' brokers.*

In initiating buy or sell transactions, securities salesworkers relay orders through their firms' offices to the floor of a securities exchange. When the trade takes place in the over-the-counter market instead, they send the order to the firm's trading department. In either case, the salesworker promptly notifies the customer of the completed transaction and the final price.

In addition, they provide many related services for their customers. They may explain to new investors the meaning of stock market terms and trading practices; offer the client complete financial counseling; devise an individual financial portfolio including securities, life insurance, and other investments for the customer; and advise on the purchase or sale of a particular security. Some individuals may prefer long-term investments designed for either capital growth or income over the years; others might want to make short-term investments which seem likely to rise in price quickly. Securities salesworkers furnish information about the advantages and disadvantages of each type of investment based on each person's objectives. They also supply the latest stock and bond quotations on any security in which the investor is interested, as well as information on the activities and financial positions of the corporations these securities represent.

Securities salesworkers may serve all types of customers or they may specialize in one type only, such as institutional investors. They also may specialize in handling only certain kinds of securities such as mutual funds. Some handle the sale of "new issues," such as corporation securities issued for plant expansion funds.

Beginning securities salesworkers spend much of their time searching for customers. Once they have established a clientele, however, they put more effort into servicing existing accounts and less into seeking new ones.

Places of Employment

About 100,000 persons—about 10 percent of them women—sold securities full time in 1974. It is estimated that an additional 100,000 persons sold securities less than full time. These include partners and branch office managers in securities firms, insurance agents and brokers offering securities to their customers, and part-time mutual fund representatives.

Securities salesworkers are employed by brokerage firms, investment bankers, and mutual funds in all parts of the country. Many of these firms are very small. Most salesworkers, however, work for a small number of large firms with main offices in big cities (especially in New York) or the approximately 6,000 branch offices in other areas.

Training, Other Qualifications, and Advancement

Because a securities salesworker must be well informed about economic conditions and trends, a college education is increasingly important, especially in the larger securities firms. This is not true, however, for part-time work selling mutual funds. Although employers seldom require specialized training, courses in business administration, economics, and finance are helpful.

Almost all States require persons who sell securities to be licensed. State licensing requirements may include passing an examination and furnishing a personal bond. In addition, salesworkers usually must register as representatives of their firms according to regulations of the securities exchanges where they do business or the National Association of Securities Dealers, Inc.

(NASD). Before beginners can qualify as registered representatives, they must pass the Securities and Exchange Commission's (SEC's) General Securities Examination, or examinations prepared by the exchanges or the NASD. These tests measure the prospective representative's knowledge of the securities business. Character investigations also are required. Before securities salesworkers can sell insurance, they must be licensed by the State in which they live.

Most employers provide training to help salesworkers meet the requirements for registration. In member firms of all major exchanges the training period is at least 4 months. Trainees in large firms may receive classroom instruction in security analysis and effective speaking, take courses offered by schools of business and other institutions and associations, and undergo a period of on-the-job training. In small firms, and in mutual funds and insurance companies, training programs may be brief and informal. Beginners read assigned materials and watch other salesworkers transact business.

Many employers consider personality traits as important as academic training. Employers seek applicants who are well groomed, able to motivate people, and ambitious. Because maturity and the ability to work independently also are important, many emexployers prefer to hire those who have achieved success in other jobs. Successful sales or managerial experience is very helpful to an applicant.

The principal form of advancement for securities salesworkers is an increase in the number and the size of the accounts they handle. Although beginners usually service the accounts of individual investors, eventually they may handle very large accounts such as those of banks and pension funds. Some experienced salesworkers advance to positions as branch office managers, who supervise the work of other salesworkers while executing "buy" and "sell" orders for their own customers. A few representatives may become partners in their firms or do administrative work.

Employment Outlook

The number of securities salesworkers is expected to grow faster than the average for all occupations through the mid-1980's as investment in securities continues to increase. In addition to jobs resulting from growth, several thousand salesworkers will be needed annually to replace those who die, retire, or transfer to other jobs. Replacement needs are relatively large, due to the competitive nature of the occupation. Many salesworkers leave their jobs each year because they are unable to establish a successful clientele.

Employment of securities salesworkers is expected to expand as economic growth and rising personal incomes increase the funds available for investment. The formation of investment clubs, which enable small investors to make minimum monthly payments toward the purchase of securities, also will contribute to the demand for securities salesworkers. Growth in the number of institutional investors will be particularly strong as more people purchase insurance; participate in pension plans; contribute to the endowment funds of colleges and other nonprofit institutions, and deposit their savings in banks. In addition, more workers will be needed to sell securities issued by new and expanding corporations and by State and local governments financing public improvements.

The demand for securities salesworkers fluctuates as the economy expands and contracts. Thus, in an economic downturn, the number of persons seeking jobs

may exceed the number of openings—sometimes by a great deal. Over the long-run, however, job opportunities for securities salesworkers are expected to be favorable. During severe slumps in market activity, job prospects and income stability will be greater for salesworkers who are qualified to provide their clients with complete financial services than those who rely strictly on commissions from stock transactions.

Mature individuals with successful work experience should find many job opportunities. Demand will be strongest for well-rounded persons who are willing to learn all aspects of the securities business. Those seeking part-time work will be limited to selling shares in mutual funds.

Earnings and Working Conditions

Trainees usually are paid a salary until they meet licensing and registration requirements. After registration, a few firms continue to pay a salary until the new representative's commissions increase to a stated amount. The salaries paid during training usually range from $800 to $1,000 a month; those working for large securities firms may receive higher salaries.

After candidates are licensed and registered, their earnings depend on commissions from the sale or purchase of stocks and bonds, life insurance, or other securities for customers. Commission earnings are likely to be high when there is much buying and selling, and lower when there is a slump in market activity. Most firms provide salesworkers with a steady income by paying a "draw against commission"—that is, a minimum salary based on the commissions which then can be expected to earn. A few firms pay salesworkers only salary and bonuses, that usually are determined by the volume of company business.

Earnings of full-time, experienced securities salesworkers averaged about $21,000 a year in 1974, according to the limited data available. Many earned more than $30,000 a year. Full-time securities salesworkers earn about three times as much as average earnings for nonsupervisory workers in private industry, except farming.

Securities salesworkers usually work in offices where there is much activity. In large offices, for example, rows of salesworkers sit at desks in front of "quote boards" which continually flash information on the prices of securities transactions. Although established salesworkers usually work the same hours as others in the business community, beginners who are seeking customers may work longer. Some salesworkers accommodate customers by meeting with them in the evenings or on weekends.

Sources of Additional Information

Further information concerning a career as a securities salesworker may be obtained from the personnel departments of individual securities firms.

WHOLESALE TRADE SALESWORKERS

(D.O.T. 260. through 289.458)

Nature of the Work

Salesworkers in wholesale trade play an important role in moving goods from the factory to the consumer. Each salesworker may represent a wholesaler that distributes hundreds of similar products. A wholesale drug company, for example, may stock its warehouse with many brands of drugs, soap, and cosmetics to supply stores that sell directly to the consumer. Likewise, a wholesale building materials distributor sells hardware and construction materials to builders who would otherwise have to deal with many manufacturers.

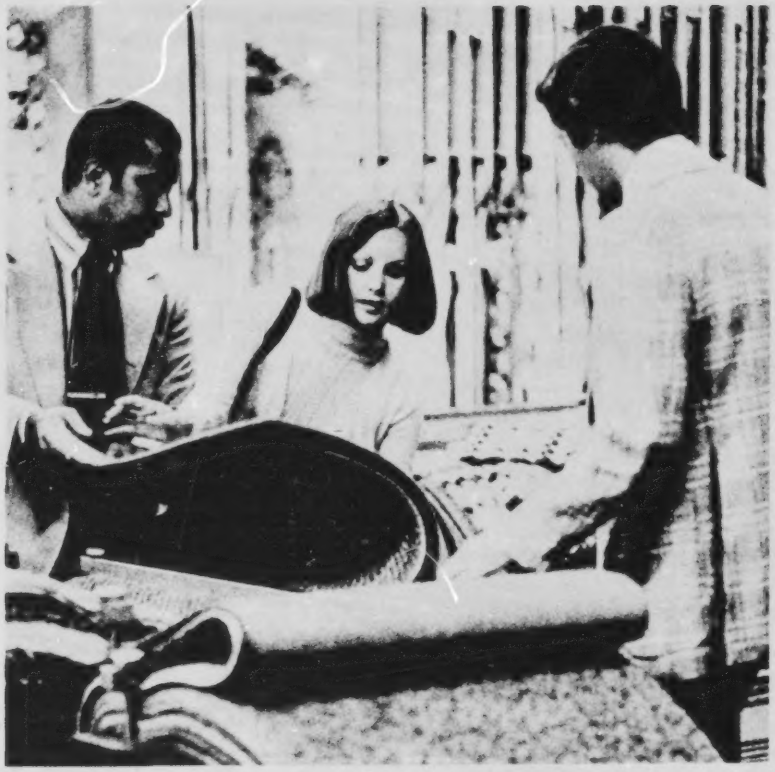
At regular intervals, salesworkers visit buyers for retail, industrial, and commercial firms, as well as buyers for institutions such as schools and hospitals. They show samples, pictures, or catalogs that list the items which their company stocks. Salesworkers seldom urge customers to purchase any particular product, since they handle a large number of items. Instead, they offer prompt, dependable service so buyers will become regular customers.

Wholesale salesworkers perform many important services, such as checking the store's stock and ordering items that will be needed before the next visit. Some wholesale salesworkers help store personnel improve and update systems for ordering and inventory. In addition, they often advise retailers about advertising, pricing, and arranging window and counter displays. A salesworker who handles specialized products, such as air-conditioning equipment, may give technical assistance on installation and maintenance.

Salesworkers do some recordkeeping and attend to other details. They must forward orders to their wholesale houses, prepare reports and expense accounts, plan work schedules, draw up lists of prospects, make appointments, and study literature relating to their products. Some collect money for their companies.

Places of Employment

About 770,000 persons were employed as wholesale salesworkers in 1974. Wholesale houses usually are located in cities, but salesworkers may be assigned territories in any part of the country. Their territory may cover a small section of a city having many retail stores and industrial users; in less populated regions



Wholesale salesworker examines retail store's carpet selection before writing new order.

it may cover half a State or more.

Firms selling machinery and building materials to industrial and business users are leading employers of wholesale salesworkers. Other large employers are companies that sell food products. Wholesalers dealing in drugs, dry goods and apparel, motor vehicle equipment, and electrical appliances employ many salesworkers as well.

Training, Other Qualifications, and Advancement

In hiring trainees for sales work, most wholesalers seek people who are neat, outgoing, self-confident, enthusiastic about the job, and understanding of human nature. As in most selling jobs, skills in arithmetic and a good memory are assets. High school graduation is usually required, although many companies prefer applicants who have specialized training beyond high school. An engineering degree may be required to sell scientific and technical products.

Newly hired salesworkers who are college graduates usually participate in formal training programs that combine classroom instruction and short rotations in various nonselling jobs. By working a few weeks in the wholesaler's warehouse, a new employee may gain first-hand experience in writing orders, pricing, and locating stock. Through cooperative programs, some college students combine academic study and on-the-job experience. Graduates with this background often begin outside saleswork without further training.

High school graduates may begin a career with a wholesale firm in a nonselling job or be hired as a sales trainee. In either case, beginners usually work in several kinds of nonselling jobs before being assigned to sales. They may start in the stockroom or shipping department to become familiar with the thousands of items the wholesaler carries. Later they may learn the prices of articles and discount rates for goods sold in quantities. Next, they are likely to work on "inside" sales, and write telephone orders. Later, as they accompany an experienced salesworker on calls, trainees come to know some of the firm's customers. The time spent in these initial jobs varies among companies, but usually it take 2 years or longer to prepare trainees for outside selling.

Experienced salesworkers who have leadership qualities and sales ability may advance to supervisor, sales manager, or other executive positions.

Employment Outlook

Employment opportunities for salesworkers in wholesale trade are expected to be good. In addition to new positions created by growth, many openings will stem from turnover, which is fairly high in this occupation. A person's success in selling greatly depends on his or her ability to locate new customers and persuade them to buy. A number of new salesworkers find they are not suited to the competitive nature of selling and leave the occupation.

The number of wholesale salesworkers is expected to grow about as fast as the average for all occupations through the mid-1980's. Businesses and institutions will require a wide variety of products for their own use and for

eventual resale. Although many large purchasers and others who require highly specialized products will buy directly from manufacturers, the majority of transactions will involve the wholesale distributor.

As chain stores and other large firms centralize purchasing activities, the value of the sales made to individual customers becomes larger and competition for sales correspondingly greater. Wholesalers can be expected to meet this competition by emphasizing customer services and increasing the size of their sales forces.

Earnings and Working Conditions

According to limited information, most beginning salesworkers earned around $9,000 a year in 1974. Experienced salesworkers earned considerably more. Since commissions often make up a large proportion of the salesworker's income, earnings vary widely in this occupation. In general, wholesale salesworkers' earnings are much higher than those of nonsupervisory workers in private industry, except farming.

Most employers pay a salary plus a percentage commission on sales; others pay a straight commission. Although most wholesale salesworkers have steady, year-round work, sales (and commissions) vary because demand for some products—for example, air-conditioning—is greater during certain seasons. To provide salesworkers with a steady income, many companies pay experienced personnel a "draw" against annual commissions. Most companies furnish cars or allowances for cars and reimbursements for certain expenses on the road.

Salesworkers often have long, irregular work hours. Although they call on customers during business hours, they may travel at night or on weekends to meet their schedule. However, most salesworkers seldom are away from home for more than a few days at a time. They may spend evenings writing reports and orders, may carry heavy catalogs and sample cases, and be on their feet for long periods.

Depending on length of service, most salesworkers have a 2- to 4-week paid vacation. Many are covered by company benefits, including health and life insurance and retirement pensions.

Sources of Additional Information

Information on jobs in wholesale selling may be obtained directly from local wholesale houses or from associations of wholesalers in many of the larger cities. If no local association is available, write to:

National Association of Wholesaler-Distributors, 1725 K St. NW., Washington, D.C. 20006.

Sales and Marketing Executives International, Student Education Division, 380 Lexington Ave., New York, N.Y. 1001

CONSTRUCTION OCCUPATIONS

Construction craft workers represent the largest group of skilled workers in the Nation's labor force. Altogether, there were 3.4 million employed in 1974—about 3 out of every 10 skilled workers.

The more than 2 dozen skilled construction trades vary greatly in size. Several major trades—carpenter, painter, operating engineer, plumber, and electrician—each had more than a 200,000 workers; carpenters alone numbered more than 1 million, about one-third of all construction craft workers. In contrast, only a few thousand each were employed in trades such as marble setter, terrazzo worker, and stonemason.

What are the Construction Trades?

Workers in the construction trades build, repair, and modernize homes and all kinds of buildings. They also work on a variety of other structures, including highways, airports, and missile launching pads.

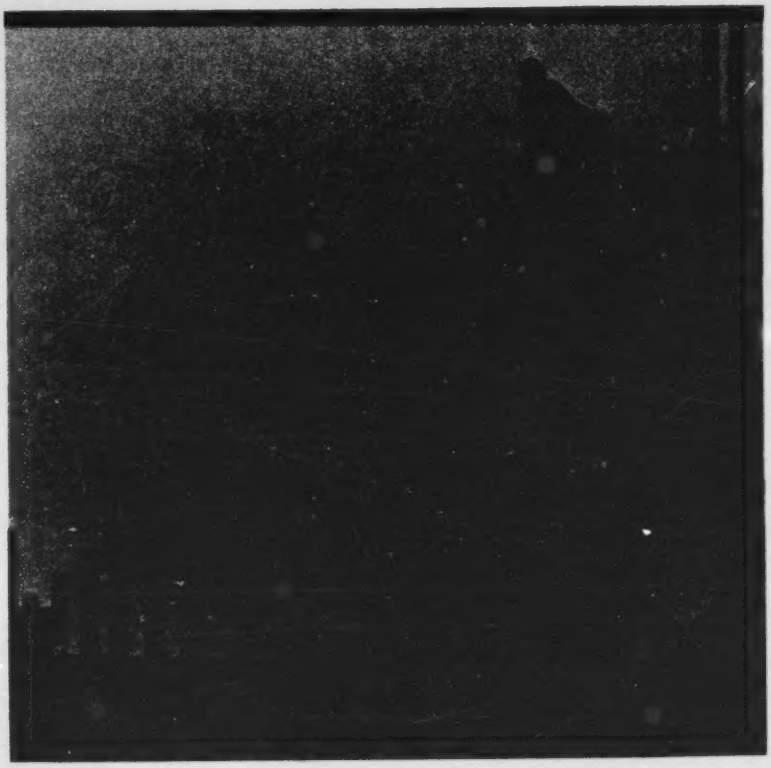
Construction work may be divided into three categories: structural, finishing, and mechanical. In general, each trade falls in one of these categories: *Structural work*: Carpenter, operating engineer (construction machinery operator), bricklayer, structural-iron worker, ornamental-iron worker, cement-mason, reinforcing-iron worker, rigger and machine mover, stonemason, and boilermaker. *Finishing work*: Lather, plasterer, marble setter, terrazzo worker, painter, paperhanger, glazier, roofer, floor covering installer, and asbestos worker. *Mechanical work*: Plumber, pipefitter, construction electrician, sheet-metal worker, elevator constructor, and millwright.

Most construction trades are described individually later in this chapter. Boilermakers and millwrights are described elsewhere in the *Handbook*. These descriptions are necessarily brief, and do not apply fully to workers in all localities.

Also, they are not statements or recommendations concerning the work jurisdiction of these trades and are inappropriate for use in jurisdictional negotiations or the settlement of jurisdictional questions.

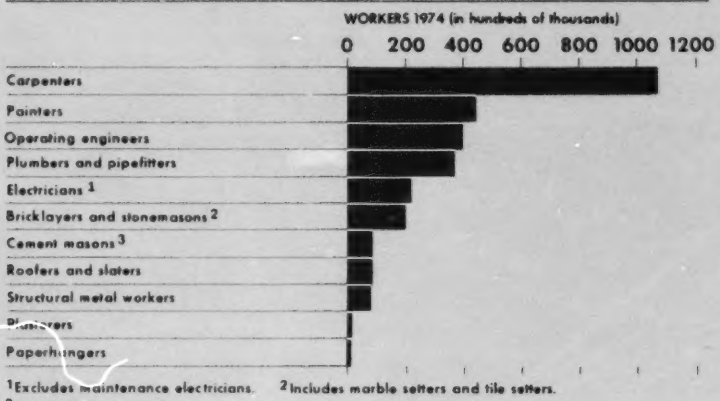
Places of Employment

Most jobs are with contractors in the construction industry. There are several hundred thousand contractors, and most are small—generally employing fewer than 10 people. Some large contractors,



Construction is a major source of employment for skilled workers.

Employment in the Construction Trades 14



[1]Excludes maintenance electricians. [2]Includes marble setters and tile setters.
[3]Includes terrazzo workers.
Source: Bureau of Labor Statistics

however, employ thousands. Large numbers of construction trade workers are employed in other industries, such as mining and manufacturing, mainly to do maintenance and repair work. Chemical manufacturers, for example, need plumbers and pipefitters to maintain the complex pipe networks in their processing plants. Government agencies employ construction trade workers to maintain highways, buildings, and sanitation systems.

Many construction tradeworkers are self-employed and contract with homeowners and businesses for small jobs. Self-employment is most common in paperhanging, painting, and floor covering work, but it also is found in other trades.

Employment in the construction trades is distributed geographically in much the same way as the Nation's population. Thus, the highest concentration generally is in industrialized and highly populated areas.

Training, Other Qualifications, and Advancement

Most training authorities recommend formal apprentice training as the best way to acquire the all-round skills in the construction trades. Apprenticeship is a prescribed period of on-the-job training, supplemented by related classroom instruction which is designed to familiarize apprentices with the materials, tools, and principles of their trade. Formal apprenticeship agreements are registered with a State apprenticeship agency or the U.S. Department of Labor's Bureau of Apprenticeship and Training.

Although apprenticeship is the best way to train, many people acquire construction skills informally by working as laborers and helpers and observing experienced craft workers. Some acquire skills by attending vocational or trade schools or by taking correspondence school courses.

Apprentices generally must be at least 18 years old, and in good physical condition. A high school or vocational school education, or its equivalent, including courses in mathematics and mechanical drawing, is desirable. Courses in construction trades, such as carpentry and electricity, also are recommended. Often, applicants are given tests to determine their aptitudes. For some trades, manual dexterity, mechanical aptitude, and an eye for proper alignment of materials are important.

The formal apprenticeship agreement generally calls for 3 to 4 years of on-the-job training and 144 hours or more of related classroom instruction each year. On the job, most instruction is given by a particular craft worker to whom the apprentice is assigned.

Classroom instruction varies among the construction trades, but usually includes courses such as history of the trade, characteristics of materials, shop mathematics, and basic principles of engineering.

In most communities, the apprenticeship programs are supervised by joint apprenticeship committees composed of local employers and local union representatives. The committee determines the need for apprentices in the community and establishes minimum standards of education, experience, and training. Whenever an employer cannot provide all-round instruction or relatively continuous employment, the committee transfers the apprentice to another employer. Where specialization by contractors is extensive—for instance, in electrical work—customarily the committee rotates apprentices among several contractors at intervals of about 6 months.

In areas where these committees have not been established, the apprenticeship agreement is solely between the apprentice and the employer or employer group. Many people have received valuable training under these programs but they have some disadvantages. No committee is available to supervise the training offered and settle differences over the terms and conditions of training. What the apprentice learns depends largely on the employer's business prospects and policies. If the employer lacks continuous work or does only a restricted type of work, the apprentice cannot develop all-round skills.

In many localities, craft workers—most commonly electricians

and plumbers—are required to have a license to work at their trade. To qualify for these licenses, they must pass an examination to demonstrate a broad knowledge of the job and of State and local regulations.

Construction trades craft workers may advance in a number of ways. Many become supervisors. In most localities, small jobs are run by "working supervisors" who work at the trade along with members of their crews. On larger jobs, the supervisors do only supervisory work. Craft workers also can become estimators for contractors. In these jobs, they estimate material requirements and labor costs to enable the contractor to bid on a particular project. Some craft workers advance to jobs as superintendents on large projects. Others become instructors in trade and vocational schools or sales representatives for building supply companies. A large number of craft workers have become contractors in the homebuilding field.

Starting a small contract construction business is easier than starting a small business in many other industries. Only moderate financial investment usually is needed, and conducting a fairly substantial business from the one's home is possible. However, the contract construction field is very competitive, and the rate of business failure is high among small contractors.

Employment Outlook

Employment in the construction trades is expected to increase faster than the average for all occupations through the mid-1980's. In addition to employment growth, many job openings will result each year from the need to replace experienced workers who transfer to other fields of work, retire, or die.

However, since construction activity is sensitive to changes in the Nation's economy, the number of openings may fluctuate sharply from year to year.

Over the long run, construction activity is expected to grow substantially. The anticipated increases in population and households, and the relatively low level of housing construction in the mid-1970's, are expected to create strong pressure for new housing. Among other factors that will stimulate construction activity are a rise in spending for new industrial plants and equipment and higher levels of personal and corporate income. Also, there will be a growing demand for alteration and modernization work on existing structures, as well as for maintenance and repair work on highway systems, dams, bridges, and similar projects.

The increase in employment is not expected to be as great as the expansion in construction activity. Continued technological developments in construction methods, tools and equipment, and materials will raise output per worker. One important development is the growing use of prefabricated units at the job site. For example, preassembled outside walls and partitions can be lifted into place in one operation. An outgrowth of prefabrication is "module building" in which units, including complete rooms, are assembled at a factory.

The rates of employment growth will differ among the various construction trades. Employment growth is expected to be fastest for asbestos and insulation workers and for operating engineers. Trades that will have the slowest growth rates are lathers and plasterers.

Earnings and Working Conditions

Hourly wage rates for construction trade workers are relatively high. However, because construction work is seasonal and time also may be lost because of occasional unemployment between jobs, annual earnings are not as high as the hourly rates of pay would indicate. The accompanying tabulation shows union hourly averages for selected construction trades in large cities surveyed in 1974.

	Hourly rate
Plumbers	$9.00
Electricians	8.96
Bricklayers	8.97
Plasterers	8.32
Carpenters	8.41
Painters	8.07

Hourly wage rates for apprentices generally start at 50 percent of the rate paid to experienced craft workers. These rates increase at 6-month to 1-year intervals until the full rate is achieved upon the completion of training.

Construction work frequently requires prolonged standing, bending, stooping, and working in cramped quarters. Exposure to weather is common as much of the work is done outdoors or in partially enclosed structures. Many people prefer construction work because it permits them to be outdoors.

Construction jobs generally are more dangerous than other jobs, but the risk of injury is lessened considerably when safe work practices are followed.

The construction trades offer especially good opportunities for young people who are not planning to go to college, but who are willing to spend several years in learning a skilled occupation. Construction workers can find job opportunities in all parts of the country. Their hourly wage rates generally are much higher than those of most other manual workers. As previously noted, construction trade workers with business ability have greater opportunities to open their own businesses than workers in most other skilled occupations.

A large proportion of construction workers are members of trade unions affiliated with the Building and Construction Trades Department of the AFL-CIO.

Sources of Additional Information

Information about opportunities for apprenticeship or other training can be obtained from local construction firms and employer associations, the local office of the State employment service or State apprenticeship agency, or the local office of the Bureau of Apprenticeship and Training, U.S. Department of Labor. Many apprenticeship programs are supervised by local union-management committees. In these instances, an apprentice applicant may apply directly to the coordinator of the committee.

For additional information on jobs in the construction trades, contact:

American Federation of Labor and Congress of Industrial Orgazations, Building and Construction Trades Department, 815 16th St. NW., Washington, D.C. 20006.

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

National Association of Home Builders, 1625 L St. NW., Washington, D.C. 20036.

For the names of labor organizations and trade associations concerned with specific trades, see the discussions of individual building trades which follow.

ASBESTOS AND INSULATION WORKERS

(D.O.T. 863.381, .781, and .884)

Nature of the Work

Asbestos and insulation workers cover pipes, boilers, furnaces, and related equipment with asbestos and other insulating materials. These materials retain heat or cold, absorb sound, and can act as a vapor barrier. Insulated walls and ceilings in a home, for example, reduce fuel costs by preventing loss of heat during the cold months.

Insulating materials are installed by pasting, wiring, taping, stud-welding, spraying, or plastering. When covering pipework, asbestos workers cut either block or formed insulation to the required size and shape, and then wrap it around the pipe. They secure the insulating material by using wire bands, or by covering it further with tar paper, cloth, or canvas, sewed or stapled into place. Care is required to cover joints completely.

When covering flat surfaces, asbestos workers spotweld or screw wire fasteners to the surface and install the insulating material. They coat joints with an asbestos cement and wrap them with tape for a tight seal. They sometimes spray or plaster insulating material to a wire mesh placed on the surface to be covered. The wire mesh provides a surface for adhesion as well as structural strength for the insulation. A final coat is applied and finished for a smooth appearance.

Asbestos and insulation workers use common handtools—trowels, brushes, scissors, sewing equipment, and stud-welding guns. Powersaws, as well as handtools, are used to cut and fit insulating materials.

Places of Employment

About 30,000 asbestos and insulation workers were employed in 1974. Most worked for insulation contractors. Others were employed to alter and maintain insulated pipework in chemical factories, petroleum refineries, atomic energy installations, and similar plants which have extensive steam installations for power, heating, and cooling. Some large firms which have cold-storage facilities also employ these workers for maintenance and repair.

Training, Other Qualifications, and Advancement

Almost all asbestos and insulation workers learn their trade through either informal on-the-job training or a formal 4-year "improvership" program. A trainee in an informal on-the-job program is assigned to an experienced insulation worker for instruction and supervision. A trainee begins with simple tasks, such as supplying insulation material to experienced workers or holding the material while they fasten it in place. In about 6 to 8 months, assignments become more complex, and within a year a trainee usually learns to measure, cut, fit, and install various types of insulation. With experience, the trainee receives less supervision and more responsibility.

Trainees who receive informal instruction usually learn to specialize in only three or four types of installation. In contrast, trainees in 4-year "improvership" programs receive in-depth instruction in almost all phases of insulation work. These programs consist of on-the-job training, as well as classroom instruction, and trainees must pass practical and written tests to demonstrate a knowledge of the trade.

For entry jobs, employers prefer high school graduates who are in good physical condition and licensed to drive. High school courses in blueprint reading, shop math, and general construction provide a helpful background.

Applicants seeking 4-year "improvership" positions must have a high school diploma or its equivalent, and be at least 18 years old.

Skilled asbestos and insulation workers may advance to supervisor, shop superintendent, or insulation contract estimator, or may open an insulation contracting business.

Employment Outlook

Employment of asbestos and insulation workers is expected to grow much faster than the average for all occupations through the mid-1980's. In addition to jobs from employment growth, several hundred

openings will arise annually from the need to replace workers who transfer to other occupations, retire, or die.

More workers will be needed to install energy-saving insulation in new homes and businesses. Insulation for boilers and pipes in new factories and power plants also will stimulate employment growth. Moreover, old buildings that need extra insulation to save fuel will add to employment requirements.

Employment opportunities will be best in metropolitan areas where most insulation contractors are located. In small towns much of the insulation work is done by persons in other trades, such as carpenters and bricklayers, rather than by asbestos and insulation workers.

Earnings and Working Conditions

Union asbestos and insulation workers in metropolitan areas had estimated average wages of $9.35 in 1974, slightly higher than the average for all union building trades workers. Apprentice wage rates start about half the rate paid to experienced workers and increase periodically.

Asbestos and insulation workers spend most of the workday on their feet, either standing, bending, stooping, or squatting. Sometimes they work from ladders or in tight spaces when covering pipes and ducts. Removing old insulation before installing new materials is often dusty and dirty and working with asbestos sometimes presents a health hazard.

A large proportion of the workers in this trade are members of the International Association of Heat and Frost Insulators and Asbestos Workers.

Sources of Additional Information

For information about asbestos and insulation workers' improvership programs or other work opportunities in this trade, contact a local asbestos contractor; a local of the union mentioned above; or the nearest office of the State employment service or State apprenticeship agency.

BRICKLAYERS AND STONEMASONS

(D.O.T. 861.381, .781, and .884)

Nature of the Work

Bricklayers build walls, partitions, fireplaces, and other structures with brick, cinder block, and other masonry materials. They also install firebrick linings in industrial furnaces.

Stonemasons build the stone exteriors of structures. They work with two types of stones—natural cut, such as marble, granite, and limestone; and artifical stone made from cement, marble chips, or other masonry materials. Because stone is expensive, stonemasons work mostly on high-cost buildings, such as offices, hotels, and churches.

In putting up a wall, bricklayers first build the corners at each end of the wall, using plumblines and a mason's level. A line is then stretched from corner to corner as a guide for each course or layer of brick. Bricklayers spread a bed of mortar (cement mixture) with a trowel, place the brick on the mortar bed, and then tap it into place.

When necessary, they cut bricks to fit around windows, doors, and other openings. Mortar joints are finished with jointing tools to leave a neat and uniform appearance. Bricklayers also weld metal supports for bricks.

Bricklayers use handtools primarily, including trowels, brickhammers, levels, chisels, and rules. Powersaws are often used for cutting and fitting bricks and other masonry materials.

Bricklayers are assisted by hod carriers, or helpers, who supply them with bricks and other materials, mix mortar, and set up and move scaffolding. (Detailed occupational descriptions for Construction Laborers and Hod Carriers appear elsewhere in the *Handbook*.)

Stonemasons often work from a set of drawings in which each stone has been numbered for identification. Helpers locate and bring the pieces needed to the masons. A derrick operator using a hoist lifts large pieces into place. Masons set the stone in mortar and move it into position with a mallet, hammer, or crowbar. They align stones with a plumbline and finish the joints with a pointing trowel. When necessary, they weld or fasten the stone to supports with metal ties or anchors.

To cut various shapes and sizes, masons find the grain of each piece of stone and use a special hammer to strike it along a predetermined line. Valuable pieces often are cut with an abrasive saw.

Stonemasons also do veneer work, in which cut stone is applied in various patterns. In one specialized branch of the trade known as alberene stone setting, masons set acid-resistant soapstone linings for vats, tanks, and floors.

The principal handtools of the stonemasons are trowels, heavy hammers, wooden or hard rubber mallets, and chisels. For rapid cutting, pneumatic tools are used. They use special power tools to smooth the surface of large stones.

Places of Employment

About 165,000 bricklayers and stonemasons were employed in 1974, most of whom were bricklayers. Workers in these crafts were employed primarily by special trade, building, or general contractors. A relatively small number of bricklayers work for government agencies or business that do their own construction and alteration work.

Workers in both trades are employed throughout the country, but are concentrated in metropolitan areas. In cities that are too small to have a demand for full-time stonemasons, some bricklayers do stonework as a sideline.

About 1 out of 7 bricklayers and stonemasons is self-employed—a proportion higher than that in most building crafts. Many of the self-employed specialize in contracting on small jobs such as patios, walks, and fireplaces.

Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of an apprenticeship program as the best way to become a bricklayer or a stonemason. Many workers, however, pick up their skills informally by working as a helper or a hod carrier and by observing and learning from experienced workers.

A bricklayer or stonemason apprenticeship program requires 3 years of on-the-job training, in addition to 144 hours of classroom instruction each year. Although these programs have some similarities, they provide different kinds of training.

On the job, bricklayer apprentices begin by learning to

spread mortar and lay brick in simple patterns. Within a year, they learn to weld and—in time—to operate equipment such as a masonry saw. Stonemason apprentices, on the other hand, begin by learning to recognize various types of stones, set and align them, and finish the joints. With experience, they also learn to weld and eventually to cut stone. Classroom instruction in either program includes blueprint reading, layout work, and sketching.

Applicants for bricklayer or stonemason apprenticeships must be at least 17 years old and in good physical condition. A high school or vocational school education is preferable, as are courses in mathematics, mechanical drawing, and shop.

Experienced bricklayers or stonemasons can advance to supervisory positions, or become estimators. They also can open contracting businesses of their own.

Employment Outlook

Employment of bricklayers is expected to increase about as fast as the average for all occupations through the mid-1980's. In addition to the job openings that result from employment growth, many openings will arise as experienced bricklayers retire, die, or transfer to other occupations.

As population and business growth create a need for new homes, factories, offices, and other structures, the demand for bricklayers will grow. Stimulating this growth will be the increasing use of brick for decorative work on building fronts and in lobbies and foyers. The use of brick, particularly for interior load-bearing walls, is growing and will add to overall employment needs.

Over the long run, job openings for bricklayers are expected to be plentiful; however, the number of openings may fluctuate from year to year because employment in this trade is sensitive to ups and downs in construction activity. For any given year, opportunities usually are best during the spring and summer when construction activity picks up.

Employment of stonemasons is not expected to change significantly through the mid-1980's. Stone has lost popularity as a building material because it has become much more expensive than other materials such as brick and concrete. Nevertheless, a relatively small number of jobs will become available due to the need to replace stonemasons who retire, die, or transfer to other occupations.

Earnings and Working Conditions

Bricklayers averaged $8.97 an hour and stonemasons $8.85 an hour, according to a 1974 survey of union wage rates in metropolitan areas. In comparison, the average for all building trades was $8.16 an hour.

Although hourly rates for these workers are relatively high, time lost because of poor weather and occasional unemployment between jobs makes annual earnings less than the hourly rates would imply.

Wages for apprentices in either trade usually start at 50 percent of the rate paid to experienced workers and increase periodically according to a set scale.

The work of bricklayers and stonemasons is sometimes strenuous because it involves moderately heavy lifting and prolonged standing and stooping. Most of the work is performed outdoors.

A large proportion of bricklayers and stonemasons are members of the Bricklayers, Masons and Plasterers' International Union of America.

Sources of Additional Information

For details about apprenticeships or other work opportunities in these trades, contact local bricklaying or stonemasonry contractors; a local of the union listed above; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of either bricklayers or stonemasons, contact:

Bricklayers, Masons and Plasterers' International Union of America, 815 15th St. NW., Washington, D.C. 20005.

Information about the work of bricklayers also may be obtained from:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

Brick Institute of America, 1750 Old Meadow Rd., McLean, Va. 22101.

CARPENTERS

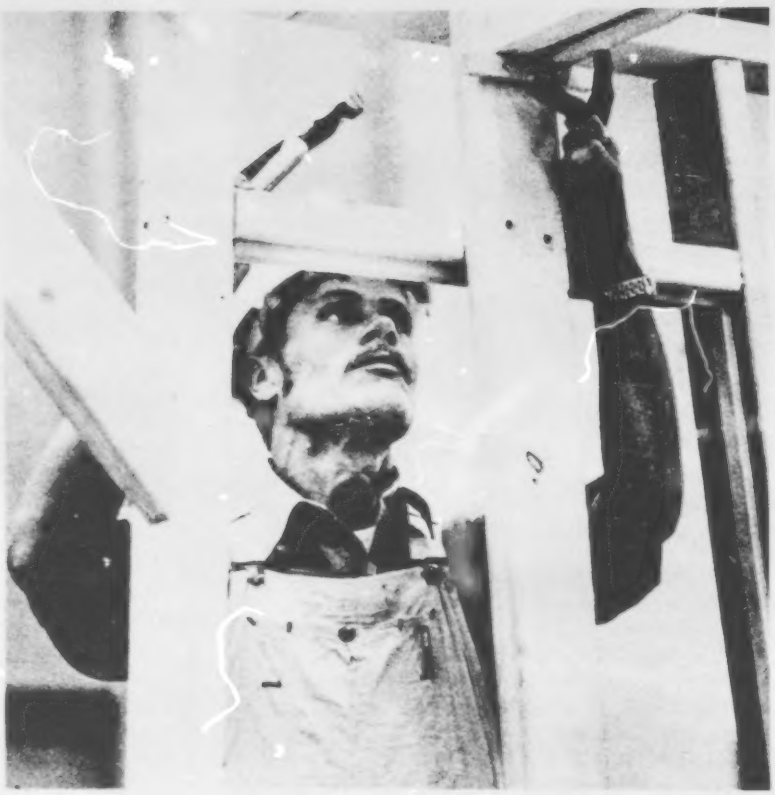
(D.O.T. 860.281 through .781)

Nature of the Work

Carpenters, the largest group of building trades workers, are employed in almost every type of construction activity. They erect the wood framework in buildings and install windows, doors, paneling, cabinets, and other items. They also build stairs, lay hardwood floors, and install other flooring materials such as asphalt tile.

Carpenters install heavy timbers used to build docks, railroad trestles, and similar structures. They build the forms needed to pour concrete decks, columns, piers, and retaining walls used in construction of bridges, buildings, and other structures. They erect scaffolding and temporary buildings at the construction site.

Because of the variety of work in the trade, some carpenters specialize in a particular type of carpentry. For example, some build forms to receive concrete; others install millwork and finish hardware



(trimming), lay and finish hardwood floors, or build stairs. Specialization is more common in large cities; in small communities, carpenters often perform a wider range of tasks. In rural areas, carpenters may do insulating, painting, or roofing. Carpenters generally stay in a particular field of construction, such as home, bridge, or highway construction, or in industrial maintenance.

Carpenters use nails, bolts, wood screws, or glue to fasten lumber, plywood, and other materials. They use handtools such as hammers, saws, and chisels, and power tools such as electric saws, drills, and powder-actuated fastening devices.

Places of Employment

About 1,060,000 carpenters were employed in 1974. Most carpenters work for contractors and homebuilders who construct new buildings and other structures. A substantial number, however, alter, remodel, or repair buildings. Some carpenters alternate between wage employment for contractors and self-employment on small jobs. Others work for government agencies, utility companies, or manufacturing plants. A large number of carpenters maintain and repair facilities within factories, hotels, office buildings, and other large establishments. Still others are employed in shipbuilding, in mining, and in the production of many kinds of display materials such as signs and billboards.

Carpenters work throughout the country and, because of their versatility, are much less concentrated geographically than any other construction occupation.

Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of an apprenticeship program as the best way to learn carpentry. A large number of workers in this trade, however, have acquired their skills informally (for example, by working as carpenters' helpers).

The apprenticeship program usually consists of 4 years of on-the-job training, in addition to a minimum of 144 hours of related classroom instruction each year. On the job, apprentices learn elementary structural design and become familiar with the common systems of frame and concrete form construction. They also learn to use the tools, machines, equipment, and materials of the trade. In addition, they learn the many carpentry techniques, such as laying out, framing, and finishing.

Apprentices receive classroom instruction in drafting and blueprint reading, mathematics for layout work, and the use of woodworking machines. Both in the classroom and on the job they learn the relationship between carpentry and the other building trades, because the work of the carpenter is basic to the construction process.

Persons interested in carpentry should obtain the all-round training given in apprenticeship programs. Carpenters with such training will be in much greater demand and will have better opportunities for advancement than those who can do only the relatively simple, routine types of carpentry.

Apprenticeship applicants generally must be at least 17 years old. A high school or vocational school education is desirable, as are courses in carpentry, shop, mechanical drawing, and general mathematics. Good physical condition, a good sense of balance, and lack of fear of working on high structures are important assets. Applicants should also have manual

dexterity and the ability to solve arithmetic problems quickly and accurately. In addition, they should be able to work closely with others.

Carpenters may advance to carpenter supervisors or to general construction supervisors. Carpenters usually have greater opportunities than most other construction workers to become general construction supervisors since they are involved with the entire construction process. Some carpenters are able to become contractors and employ others. About 1 out of 5 carpenters is self-employed, a higher proportion than the average for all building trades.

Employment Outlook

Job opportunities for carpenters should be plentiful over the long run. Because of the large number of people employed in this field, replacement needs are high. Besides the job openings that result from the need to replace carpenters who retire, die, or transfer to other occupations, many openings will be created by employment growth.

Employment of carpenters is expected to grow about as fast as the average for all occupations through the mid-1980's. Population and business growth will lead to a demand for more houses and other structures, thus increasing the demand for carpenters. More carpenters also will be needed for alteration and maintenance work. However, because construction activity is sensitive to ups and downs in the economy, the number of job openings may fluctuate greatly from year to year.

Earnings and Working Conditions

According to a survey of metropolitan areas, union wage rates for carpenters averaged $8.41 an hour in 1974, compared with $8.16 for union workers in all building trades. Annual earnings, however, may not be as high as the hourly rates would indicate, because carpenters lose some worktime due to poor weather and occasional unemployment between jobs.

Hourly wage rates for apprentices usually start at about 50 percent of the rate paid to experienced carpenters and increase by about 5 percent at 6-month intervals.

As in other building trades, the carpenter's work is active and sometimes strenuous, but exceptional physical strength is not required. However, prolonged standing, as well as climbing and squatting, often are necessary. Carpenters risk injury from slips or falls, from contact with sharp or rough materials, and from the use of sharp tools and power equipment. Many people like carpentry because they can work outdoors.

A large proportion of carpenters are members of the United Brotherhood of Carpenters and Joiners of America.

Sources of Additional Information

For information about carpentry apprenticeships or other work opportunities in this trade, contact local carpentry contractors, a local of the union mentioned above, a local joint union-management apprenticeship committee, or the nearest office of the State employment service of State apprenticeship agency.

For general information on apprenticeship in this trade, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

CEMENT MASONS (CEMENT AND CONCRETE FINISHERS)

(D.O.T. 844.884 and 852.884)

Nature of the Work

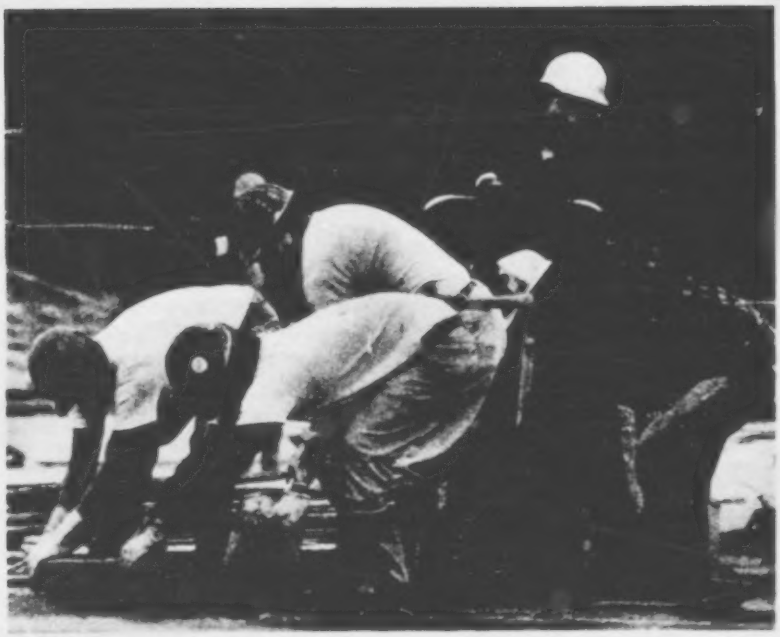
Cement masons finish concrete surfaces on many types of construction projects. The projects range from finishing of small jobs, such as patios and floors, to work on huge dams and miles of concrete highways. Finishing concrete can provide work of widely varing kinds; for example, cement masons may color concrete surfaces, expose aggregate in walls and sidewalks, or fabricate concrete beams, columns, and panels.

On small projects, a mason, assisted by one or two helpers, may do all of the masonry work; on large projects, a crew of several masons and many helpers may be employed.

In preparing the site for pouring the concrete mixture, the cement mason makes sure that the forms for molding the concrete are set for the desired pitch and depth and are properly aligned. The mason directs the pouring of the concrete and supervises laborers who use shovels or special rakes to place and spread the concrete. The mason then levels the surface further using a "straightedge" (a wood or lightweight metal rod long enough to extend across the freshly poured concrete.) The concrete is now ready for intermediate and final finishing.

The cement mason uses special tools, such as a float, whip, or darby, to fill minor depressions and remove high spots. Final finishing is usually delayed until the concrete has hardened sufficiently to support the weight of a mason on kneeboards. While the concrete is still workable, the mason uses handtools—a wood or magnesium float and a finishing trowel—to bring the concrete to the proper consistency and obtain the desired finish. Concrete finishing may be done also with power-operated trowels; however, edges, corners, and other hard-to-finish places must be troweled by hand.

On concrete work which is exposed (for example, columns, ceilings, and wall panels), cement



Cement masons prepare concrete floor.

masons correct surface defects and air pockets after the forms are stripped. This involves preparing the surface with a hammer and chisel and rubbing brick to remove high spots. A rich cement mixture is rubbed into the concrete surface using a sponge rubber float or piece of burlap to fill imperfections and voids. The end result is a uniformly smooth appearance.

Some cement masons specialize in laying a mastic coat (a fine asphalt mixture) over concrete, particularly in buildings where sound-insulated or acid-resistant floors are specified. Heavy handtools are used to smooth the mastic.

Cement masons must know their materials and be familiar with various chemical additives which speed or slow the setting time. Because of the effects of heat, cold, and wind on the curing of cement, masons must be able to recognize by sight and touch what is occurring in the cement mixture so that they can prevent structural defects.

Places of Employment

About 90,000 cement masons were employed in 1974. Cement masons work for general contractors who construct entire projects, such as highways or large buildings, and for contractors who do only concrete work. Some masons install composition resilient floors for specialty floor contractors. A small number of masons are employed by municipal public works departments, public utilities, and manufacturing firms that do their own construction work.

One out of 10 cement masons is self-employed, about the same proportion as in other building trades. Most specialize in small jobs, such as driveways, sidewalks, and patios.

Training, Other Qualifications, and Advancement

Cement masons learn their trade either through on-the-job training as helpers or through 2-year or 3-year apprenticeship programs.

On-the-job training programs provide informal instruction from experienced workers. Helpers learn to handle the tools, equipment, machines, and materials of the trade. They begin with simple tasks, such as spreading and using a straitedge on freshly poured concrete. As they advance, assignments become more complex, and usually within a year, helpers are doing finishing work.

Two-year and 3-year apprenticeship programs also provide on-the-job training in addition to 144 hours of classroom instruction each year. In the classroom, apprentices learn applied mathematics, blue-print reading, and safety. Three-year apprentices receive special instruction in layout work and estimating.

When hiring helpers and apprentic licensed to drive. High school courses in shop mathematics and blueprint reading or mechanical drawing provide a helpful background.

Experienced cement masons may advance to supervisors or contract estimators, or may open concrete contracting businesses.

Employment Outlook

Employment of cement masons is expected to grow faster than the average for all occupations through the mid-1980's. As population and business grow, more masons will be needed to help build apartments, offices, factories, and other structures. The greater use of concrete as a building material also will add to the demand for these workers. Prestressed concrete columns, for example, are being used increasingly in place of steel columns for large buildings. Besides the job openings created by employment growth, many openings will arise as experienced masons retire, die, or transfer to other fields of work.

While the employment outlook is expected to be favorable over the long run, the number of job openings may fluctuate from year

to year because construction activity is sensitive to ups and downs in the economy.

Earnings and Working Conditions

Union cement masons in metropolitan areas had estimated average wages of $8.05 an hour in 1974, about the same as the average for all union building trades workers. Union masons generally have higher wage rates than nonunion masons. Apprentices usually start at 50 percent of the rate paid to experienced cement masons.

Annual earnings for cement masons may not be as high as hourly rates would indicate because some worktime is lost due to bad weather and occasional unemployment between jobs.

Cement masons usually receive premium pay for hours worked in excess of the regularly scheduled workday or workweek. They often work overtime, because once concrete has been poured the job must be completed.

Masonwork is active and strenuous. Since most cement finishing is done on floors or at ground level the mason has to stoop, bend, or kneel. Because most jobs are outdoors, worktime is lost due to rain and freezing weather. In some cases, however, concrete can be poured year round by using heated, temporary shelters made of sheet plastic.

A large proportion of cement masons are union members. They belong either to the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or to the Bricklayers, Masons and Plasterers' International Union of America.

Sources of Additional Information

For information about apprenticeships and work opportunities, contact local cement finishing contractors; locals of unions previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about cement masons, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

Bricklayers, Masons and Plasterers' International Union of America, 815 15th St. NW., Washington, D.C. 20005.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 1125 17th St. NW., Washington, D.C. 20036.

CONSTRUCTION LABORERS

(D.O.T. 801.887, 809.887, 842.887, 844.887, 850.887, 851.887, 852.887, 853.887, 859.884 and .887, 860.887, 861.887, 862.884 and .887, 865.887, 866.887, 869.887, and 892.883)

Nature of the Work

Construction laborers work on all types of construction projects—houses, highways, dams, airports, missile sites. They are usually the first workers to arrive on a construction project—assisting in site preparation—and the last to leave. They erect and dismantle scaffolding, set braces to support the sides of excavations, and clean up rubble and debris. Laborers also help unload materials, machinery, and equipment, and deliver these goods to other construction workers, such as carpenters and masons.

On alteration and modernization jobs, laborers tear out the existing work. They perform most of the work done by wrecking and salvage crews during the demolition of buildings.

When concrete is mixed at the worksite, laborers unload and handle materials and fill mixers with ingredients. Whether the concrete is mixed on-site or hauled in by truck, laborers pour and spread the concrete and spade or vibrate it to prevent air pockets. In highway paving, laborers clean the right-of-way, grade and help prepare the site, and set the forms into which wet concrete is poured. They cover new pavement with straw, burlap, or other materials to keep it from drying too rapidly.

Some construction laborers have job titles that indicate the kinds of work they do. Bricklayers' tenders and plasterers' tenders, both commonly known as hod carriers, help bricklayers and plasterers by mixing and supplying materials, setting up and moving portable scaffolding, and providing the many other services needed. Hod carriers must be familiar with the work of bricklayers and plasterers and have knowledge of the materials and tools they use. Some hod carriers also help cement masons. Carpenters' helpers assist carpenters by supplying materials, such as lumber, plywood, and nails, and by

Construction work is physically strenuous.

doing simple carpentry tasks, such as cutting forms to size and nailing them together.

Construction laborers are commonly classified as unskilled workers, but this term can be misleading. Many jobs require training and experience, as well as a broad knowledge of construction methods, materials, and operations. Rock blasting, rock drilling, and tunnel construction are examples of work in which "know-how" is important. Laborers who work with explosives drill holes in rock, handle explosives, and set charges. They must know the effects of different explosive charges under varying rock conditions to prevent injury and property damage. Laborers do almost all the work in the boring and mining of a tunnel, including operations which would be handled by workers in other trades if the job were located above ground.

Places of Employment

About 875,000 construction laborers were employed in 1974. Most of them worked for construction contractors, for State and city public works and highway departments, and for public utility companies.

Training, Other Qualifications, and Advancement

Little formal training is needed to get a job as a construction laborer. Generally, applicants must be at least 18 years old and in good physical condition. Beginners' first jobs are usually of the simplest type, such as unloading trucks and digging ditches. As they gain experience, job assignments become more complex.

Many tasks assigned to laborers require particular skills which have become too complex to learn through on-the-job training alone. As a result, contractors and unions have established formal training programs in many parts of the country. These programs, which may last from 4 to 8 weeks, include basic construction concepts and safety practices, as well as machinery operation.

After several years of experience and training, many laborers advance to craft jobs, such as carpenter, bricklayer, or cement mason.

Employment Outlook

Despite increases in construction activity, employment of construction laborers is expected to grow at a slower rate than the average for all occupations through the mid-1980's. Employment growth will be limited by the greater use of labor-saving equipment, such as trenching machines for digging ditches and forklifts for lifting and moving materials. Nevertheless, thousands of job openings will become available—mainly due to the need to replace laborers who transfer to other occupations, retire, or die. However, job openings may be plentiful in some years and scarce in others because the construction industry is sensitive to changing economic conditions.

Earnings and Working Conditions

Union hourly wage rates for construction laborers averaged $6.31 an hour in 1974, compared with $8.16 an hour for all union building trade workers, according to a survey of metropolitan areas.

Annual earnings for construction laborers may not be as high as hourly rates would indicate because some worktime may be lost due to bad weather and occasional unemployment between jobs.

Construction work is physically strenuous, since it requires frequent bending, stooping, and heavy lifting. Much of the work is performed outdoors. Many construction laborers are members of the Laborers' International Union of North America.

Sources of Additional Information

For information about work opportunities, contact local building or construction contractors, a local of the Laborers' International Union of North America, or the local office of the State employment service.

For general information about the work of construction laborers, contact:

Laborers' International Union of North America, 905 16th St. NW., Washington, D.C. 20006.

DRYWALL INSTALLERS AND FINISHERS

(D.O.T. 840.887 and 842.884)

Nature of the Work

Developed after World War II as a substitute for wet plaster, drywall consists of a thin wall of plaster sandwiched between two pieces of heavy paper. It is used today for walls and ceilings in building most new homes because it saves both time and money compared to traditional methods using plaster.

Two new occupations have emerged in response to the widespread use of this construction material: drywall installers and drywall finishers. Installers attach drywall panels to the framework inside houses and other buildings. Finishers do touchup work to get the panels in shape for painting.

Drywall panels are manufactured in standard sizes—for example, 4 feet by 12 feet. Thus, installers must measure and cut some pieces to fit in small spaces, such as above and below windows. They also saw holes in the panels for electric outlets, air-conditioning units, and plumbing. After making these alterations, installers apply glue to

the wooden framework, press the panels against it, and nail them down. An installer usually is assisted by a helper because large panels are too heavy and cumbersome for one person to handle.

Some installers specialize in hanging drywall panels on metal framework in offices, schools, and other large buildings. Following plans that indicate the location of rooms and hallways, they saw metal rods and channels to size, bolt them together to make floor-to-ceiling frames, and attach the drywall panels to the frames with screws. The workers also erect suspended ceilings. They hang metal bands from wires that are embedded in the concrete ceiling. The installers run the bands horizontally across the room, crisscrossing them to form rectangular spaces for the ceiling panels.

After the drywall has been installed, finishers use a paste-like compound and tape to cover the edges where the panels meet. Nail heads also are covered with this compound. Finishers sand these patched areas to make them as smooth as the rest of the wall surface. They also repair nicks and cracks caused by the installation of air-conditioning vents and other fixtures. Some finishers specialize in sanding, taping, or repair work.

Places of Employment

About 60,000 persons worked as drywall installers and finishers in 1974. Most worked for contractors that specialize in drywall construction; others worked for contractors that do all kinds of construction.

Installers and finishers are employed throughout the country, but are concentrated in urban areas. In many small towns, carpenters install drywall and painters finish it.

Training, Other Qualifications, and Advancement

Persons who become drywall installers or finishers usually start as

helpers and learn most of their skills on the job. Some employers, in cooperation with unions, offer special programs which supplement on-the-job training with a few hours of classroom instruction each week. The finisher program lasts 1 1/2 years and the installer program, 2 years.

Employers prefer high school graduates who are in good physical condition, but applicants with less education frequently are hired. High school or trade school courses in carpentry provide a helpful background for drywall work. Installers must be good at simple arithmetic.

After qualifying as an installer or finisher, a person who has leadership ability may become a supervisor within a few years. Some workers start their own drywall contracting businesses.

Employment Outlook

Employment of drywall workers is expected to grow faster than the average for all occupations through the mid-1980's due to increases in construction activity. Besides the workers hired to fill demand, many will be hired to replace those who retire, die, or take jobs in other occupations. Because construction activity fluctuates, however, the number of new workers needed may vary greatly from year to year.

Most job openings will be in metropolitan areas. Building contractors in small cities may not have enough business to hire full-time drywall workers.

Earnings and Working Conditions

According to limited information, drywall installers earned from $5.50 to $7 an hour in 1974, and finishers earned from $6 to $8. By comparison, all nonsupervisory workers in private industry, except farming, average $4.02 an hour.

Many contractors pay installers and finishers according to the amount of work they complete—for example, 5 cents for each square foot of panel installed.

A 40-hour week is standard for installers and finishers, but they sometimes work longer. Those who are paid hourly rates receive premium pay for overtime. Unlike many construction workers, installers and finishers work indoors and do not lose time and pay when the weather is bad.

As in other construction trades, drywall work is sometimes strenuous. Installers and finishers spend most of the day on their feet, either standing, bending, stooping, or squatting. Installers have to lift and maneuver heavy panels. Hazards include the possibility of falls from ladders and injuries from power tools.

Some installers are members of the United Brotherhood of Carpenters and Joiners of America, and some finishers are members of the International Brotherhood of Painters and Allied Trades.

Sources of Additional Information

For details about job qualifications and training programs, write to:

Gypsum Drywall Contractors International, 2010 Massachusetts Ave. NW., Suite 600, Washington, D.C. 20036.

ELECTRICIANS (CONSTRUCTION)

(D.O.T. 821.381, 824.281, and 829.281 and .381)

Nature of the Work

Heat, light, power, air-conditioning, and refrigeration components all operate through electrical systems that are assembled, installed, and wired by construction electricians. These workers also install electrical machinery, electronic equipment, controls, and signal and communications systems. (Maintenance electricians, who usually maintain the electrical systems installed by construction electricians, are discussed elsewhere in the *Handbook*.) Construction electricians follow blueprints and specifications for most installations. To install wiring in factories and offices, they may bend and fit conduit (pipe or tubing) inside partitions, walls, or other concealed areas. They then pull insulated wires or cables through the conduit to complete the circuit between outlets and switches. In lighter construction, such as housing, plastic-covered wire is usually used rather than conduit. In any case, electricians connect the wiring to circuit breakers, transformers, or other components. Wires are joined by soldering or mechanical means. When the wiring is finished, they test the circuits for proper connections and grounding.

Electricians, for safety reasons, must follow National Electrical Code regulations and, in addition, must fulfill requirements of State, county, and municipal electrical codes.

Electricians generally furnish their own tools, including screwdrivers, pliers, knives, and hacksaws. Employers furnish heavier tools, such as pipe threaders, conduit benders, and most test meters and power tools.

Places of Employment

Most of the 245,000 construction electricians employed in 1974 worked for electrical contractors. Many others were self-employed contractors. A small number of electricians worked for government agencies or businesses that do their own electrical work. Construction electricians are employed throughout the country, but are concentrated in industrialized and urban areas.

Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of a 4-year apprenticeship program as the best way to learn the electrical trade. However, some people learn the trade informally by working for many years as electricians' helpers. Many helpers gain additional knowledge through trade school or correspondence courses, or through special training in the Armed Forces.

Apprenticeship programs are sponsored through and supervised by local union-management committees. These programs provide 144 hours of classroom instruction each year in addition to comprehensive on-the-job training. In the classroom, apprentices learn blueprint reading, electrical theory, electronics, mathematics, and safety and first-aid practices. On the job, under the supervision of experienced electricians, apprentices must demonstrate mastery of electrical principles. At first, apprentices drill holes, set anchors, and set up conduit. In time and with experience, they measure, bend, and install conduit, as well as install, connect, and test wiring. They also learn to set up and draw diagrams for entire electrical systems.

To qualify for an apprenticeship, an applicant must be at least 18 years old and usually must be a high school or vocational school graduate with 1 year of algebra. Courses in electricity, electronics, mechanical drawing, science, and shop provide a good background. Although physical strength is not essential, manual dexterity, agility, and good health are important. Good color vision is necessary because electrical wires frequently are identified by color.

To obtain a license, which is necessary for employment in most cities, an electrician must pass an examination which requires a thorough knowledge of the craft and of State and local building codes.

Experienced construction electricians can advance to supervisors, superintendents, or contract estimators for contractors on construction jobs. Many electricians start their own contracting businesses. In most large urban areas, a contractor must have a master electrician's license.

Employment Outlook

Employment of construction electricians is expected to increase faster than the average for all occupations through the mid-1980's. As population and business grow, more electricians will be needed to install electrical fixtures and wiring in new homes, offices, and other buildings. In addition to jobs created by employment growth, many openings will arise as experienced electricians retire, die, or transfer to other occupations.

While employment in this field is expected to grow over the long run, it may fluctuate from year to year due to ups and downs in construction activity. When construction jobs are not available, however, electricians may be able to transfer to other types of electrical work. For example, they may find jobs as maintenance electricians in factories, or jobs as electricians in shipbuilding or aircraft manufacturing.

Earnings and Working Conditions

According to a survey of

Electrician installs wiring.

metropolitan areas, union wage rates for electricians averaged $8.96 an hour in 1974, compared with $8.16 for all union building trades workers. Because the seasonal nature of construction work affects electricians less than workers in most building trades, their annual earnings also tend to be higher.

Apprentice wage rates start at from 40 to 50 percent of the rate paid to experienced electricians and increase periodically.

Construction electricians are not required to have great physical strength, but they frequently must stand for long periods and work in cramped quarters. Because much of their work is indoors, electricians are less exposed to unfavorable weather than are most other construction workers. They risk electrical shock, falls from ladders and scaffolds, and blows from falling objects. However, safety practices have helped to reduce the injury rate.

A large proportion of construction electricians are members of the International Brotherhood of Electrical Workers.

Sources of Additional Information

For details about electrician apprenticeships or other work opportunities in this trade, contact local electrical contractors; a local union of the International Brotherhood of Electrical Workers; a local union-management apprenticeship committee, or the nearest office of the State employment service or State apprenticeship agency. Some local employment service offices screen applicants and give aptitude tests.

For general information about the work of electricians, contact:

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

National Electrical Contractors Association, 1730 Rhode Island Ave. NW., Washington, D.C. 20036.

National Joint Apprenticeship and Training Committee for the Electrical Industry, 1730 Rhode Island Ave. NW., Washington, D.C. 20036.

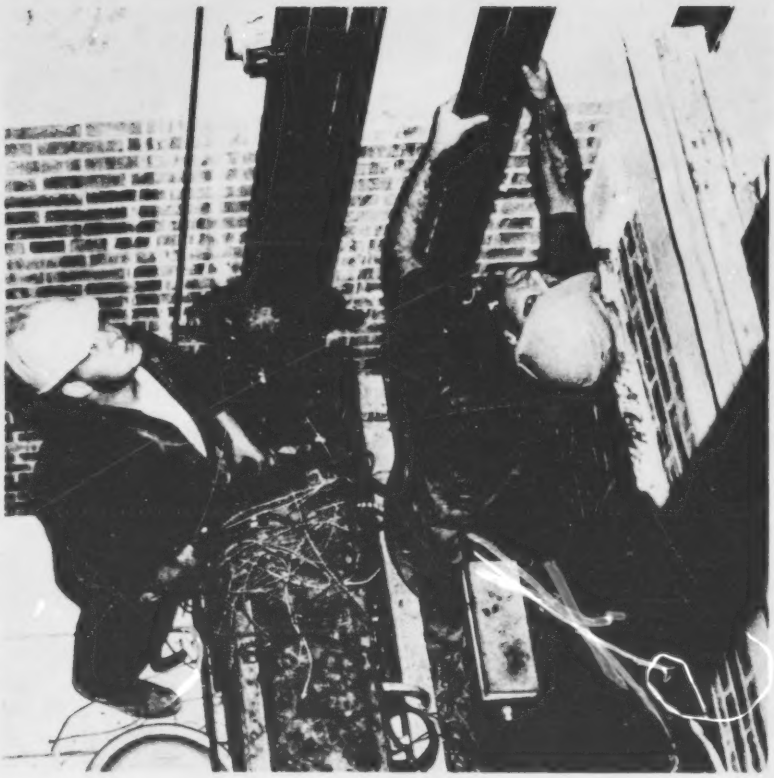
ELEVATOR CONSTRUCTORS

(D.O.T. 825.381 and 829.281)

Nature of the Work

Elevator constructors, also called elevator mechanics, assemble and install elevators, escalators, and similar equipment. In new buildings, they install equipment during construction. In older buildings, they replace earlier installations with new equipment. Once the equipment is in service, they maintain and repair it. Installation or repair work is usually performed by small crews consisting of skilled elevator constructors and their helpers.

In elevator construction, the crew first installs the guide rails of the car in the elevator shaft. Next, they install the hoisting machines, the car frame and platform, controls, and other elevator parts. The crew than cables the car frame to a counterweight, installs the cab body and roof, and wires the electrical control system. Finally, the entire assembly is carefully adjusted and tested. Similar procedures are followed to install other equipment, such as escalators. Alteration work is similar to new installation because all elevator equipment except the old rail, car frame, platform, and counterweight is generally replaced. Elevator



Growth in high-rise buildings will increase demand for elevator constructors.

mechanics inspect elevator and escalator installations periodically and, when necessary, adjust cables and lubricate or replace parts.

Alteration work on elevators is important because of the rapid rate of innovation and improvement in elevator engineering.

To install and repair modern elevators, most of which are electrically controlled, elevator constructors must have a working knowledge of electricity, electronics, and hydraulics. They also must be able to repair electric motors, as well as control and signal systems. Because of the variety of their work, they use many different handtools, power tools, and testing meters and gauges.

Places of Employment

Most of the estimated 19,000 elevator constructors in 1974 were employed by elevator manufacturers to do installation, modernization, and repair work. Some are employed instead by small, local contractors who specialize in elevator maintenance and repair. Still others work for government agencies or business establishments that do their own elevator maintenance and repair. Elevator constructors are employed as elevator inspectors, also, for municipal or other government licensing and regulatory agencies.

Training, Other Qualifications, and Advancement

Almost all elevator constructors learn their skills primarily through on-the-job training supplemented by classroom instruction. On the job, trainees are assigned initially to experienced elevator mechanics. Beginning tasks include carrying materials and tools, bolting rails to walls, and assembling cab parts. Eventually, tasks become more complex and require greater knowledge and skill. For example, electrical wiring requires a knowledge of local and national electrical codes and of electrical theory. Later on, trainees learn to test elevators and adjust them for maximum performance. In the classroom, trainees learn electrical and electronic theory, mathematics, applications of physics, and safety techniques.

Generally, training advancement depends upon the trainee's ability and level of experience. The average trainee usually qualifies as a helper after 6 months of experience and usually becomes a fully qualified elevator constructor within 4 years. Some States and cities require elevator constructors to pass a licensing examination.

Applicants for trainee positions must be at least 18 years old and have a high school or vocational school education; courses in electricity, mathematics, and physics can provide a useful background. Applicants also must pass an aptitude test before training begins. Good physical condition and a high degree of mechanical aptitude are important.

Some constructors advance to jobs as supervisors or elevator inspectors. A relatively small number go into the elevator contracting business.

Employment Outlook

Employment in this small occupation is expected to increase faster than the average for all occupations through the mid-1980's. Growth in the number of high-rise apartment and commercial buildings will create job openings in elevator construction, as will the need to replace experienced workers who retire, die, or stop working for other reasons. The total number of job openings will be limited, however,

because of the relatively small size of the occupation.

Earnings and Working Conditions

Both the hourly wage rates and the annual earnings of elevator constructors are among the highest in the skilled building trades. These workers lose less worktime because of seasonal factors than do most other building trades workers.

Union elevator constructors in metropolitan areas had estimated average wages of $9 an hour in 1974, slightly higher than the average for all union building trades workers. Hourly wage rates for trainees start at about 50 percent of the rate paid to experienced elevator mechanics and increase periodically.

Elevator construction involves lifting and carrying heavy equipment and parts, but this is usually done by helpers. Most of the work takes place indoors and at great heights. Workers are sometimes exposed to dangers, such as falls and electrical shock.

Most elevator constructors are members of the International Union of Elevator Constructors.

Sources of Additional Information

For further details about work opportunities as a helper in this trade, contact elevator manufacturers, elevator construction or maintenance firms, or a local of the union mentioned above. In addition, the local office of the State employment service may have information about opportunities in this trade.

For general information about the work of elevator constructors, contact:

International Union of Elevator Constructors, 12 S. 12th St., Philadelphia, Pa. 19107.

FLOOR COVERING INSTALLERS

(D.O.T. 299.381 and 864.781)

Nature of the Work

Floor covering installers (also called *floor covering mechanics*) install and replace resilient tile, linoleum and vinyl sheets, and carpeting. These workers install coverings over floors made of wood, concrete, or other materials. They generally specialize in either carpet or resilient floor installation, although some do both types.

Before putting down resilient covering, such as asphalt tile, installers first inspect the floor to be sure that it is firm, dry, smooth, and free of dust or dirt. Some floors have to be prepared for covering. For example, installers may sand a rough or painted floor and fill cracks and indentations. An extremely uneven floor may be resurfaced with wood or other materials.

On newly poured concrete floors or floors laid over earthwork, installers test for moisture content. If the moisture is too great, they may suggest postponing installation of floor covering or recommend a covering technique suited to the floor's condition.

Resilient-flooring installers measure and mark off the floor according to a plan. The plan may be architectural drawings that specify every detail of the covering design, or a simple, verbal description by the customer. When the plan is completed, installers, often assisted by apprentices or helpers, cut, fit, and glue the flooring into place. It must be carefully fit, particularly at door openings, along irregular wall surfaces, and around fixtures, such as columns or pipes. Installers must take special care also in cutting out and setting in decorative designs. After the flooring is in place, they run a roller over it to insure good adhesion.

Carpet installers, like the installers of resilient coverings, first inspect the floor to determine its condition. Then they plan the layout after allowing for expected traffic patterns so that best appearance and long wear will be obtained. To hold the carpet after it is installed, workers fasten tackless strips with adhesive, nails, or tacks along the borders. Padding is cut and placed along the framework of the strip, and the carpet is placed approximately in position. If the carpet has not been precut and seamed, installers will do this work before stretching it into place. Edges are trimmed for a secure and smooth fit.

Places of Employment

An estimated 85,000 floor covering installers were employed in 1974. About three-fourths worked primarily with carpeting, and the remainder with resilient flooring.

Most installers worked for flooring contractors. Many others worked for retailers of floor covering and home alteration and repair contractors. About 1 out of 4 floor covering installers was self-employed, a higher proportion than the average for all building trades.

Installers are employed throughout the Nation, but most are concentrated in urban areas that have high levels of construction activity.

Training, Other Qualifications, and Advancement

The vast majority of floor covering installers learn their trades informally on the job by working as helpers to experienced installers. Most others learn through formal apprenticeship programs, which include on-the-job training, as well as related classroom instruction.

Informal training programs usually are sponsored by individual contractors and generally take about 1 1/2 years. Helpers begin with simple assignments. Helpers

Floor covering installer lays resilient tile.

on resilient flooring jobs carry materials and tools, prepare floors for the tile, and help with its installation. Carpeting helpers install tackless stripping and padding, and help stretch newly installed carpet. With experience, helpers in either trade take on more difficult assignments, such as measuring, cutting, and fitting the materials to be installed.

Some contractor-sponsored programs and apprenticeship programs provide comprehensive training that covers both carpet and resilient flooring work.

Applicants for helper or apprentice jobs should be at least 16 years old, mechanically inclined, and licensed to drive. A high school education is preferred, though not necessary. Courses in general mathematics and shop may provide a helpful background.

Floor covering installers may advance to supervisors or installation managers for large floor laying firms. Some installers become salespersons or estimators. Installers also may go into business for themselves.

Employment Outlook

Employment of floor covering installers is expected to increase about as fast as the average for all occupations through the mid-1980's. In addition to job openings resulting from employment growth, many openings will arise as experienced installers transfer to other fields of work, retire, or die.

Employment of floor covering installers is expected to increase mainly because of the expected expansion in construction and the more widespread use of resilient floor coverings and carpeting. In many new buildings, plywood will continue to replace hardwood flooring, thus making wall-to-wall carpeting a necessity. Carpeting and resilient flooring also will continue to be used extensively in renovation work. Moreover, versatile materials and colorful patterns will contribute to the growing demand for floor coverings.

Most job opportunities will be for carpet installers and workers who can install both carpeting and resilient flooring. Fewer opportunities will arise for workers who can install only resilient flooring because this is a relatively small field.

Earnings and Working Conditions

Information from a limited number of firms indicates that experienced floor covering installers earned between $5.65 and $7.90 per hour in 1974. Starting wage rates for apprentices and other trainees usually are about half of the experienced worker's rate.

Most installers are paid by the hour. In some shops, part of the pay may be in bonuses. In others, installers receive a monthly salary or are paid according to the amount of work they do.

Installers generally work regular daytime hours. Particular circumstances, however, such as installing a floor in a store or office, may require work during evenings or weekends.

Unlike many construction workers, floor covering installers usually do not lose time due to weather conditions. During the winter, most work is done in heated buildings. The jobs are not hazardous, but installers may get injuries from lifting heavy materials or from working in a kneeling position for long periods. Most injuries can be avoided if proper work procedures are followed.

Many floor covering installers belong to unions including the United Brotherhood of Carpenters and Joiners of America, and the Inter-

national Brotherhood of Painters and Allied Trades.

Sources of Additional Information

For details about apprenticeships or work opportunities, contact local flooring contractors or retailers; locals of the unions previously mentioned; or the nearest office of the State apprenticeship agency or the State employment service.

For general information about the work of floor covering installers, contact:

Carpet and Rug Institute, P.O. Box 2048, Dalton, Ga. 30720.

Resilient Tile Institute, 101 Park Ave., New York, N.Y. 10017.

GLAZIERS

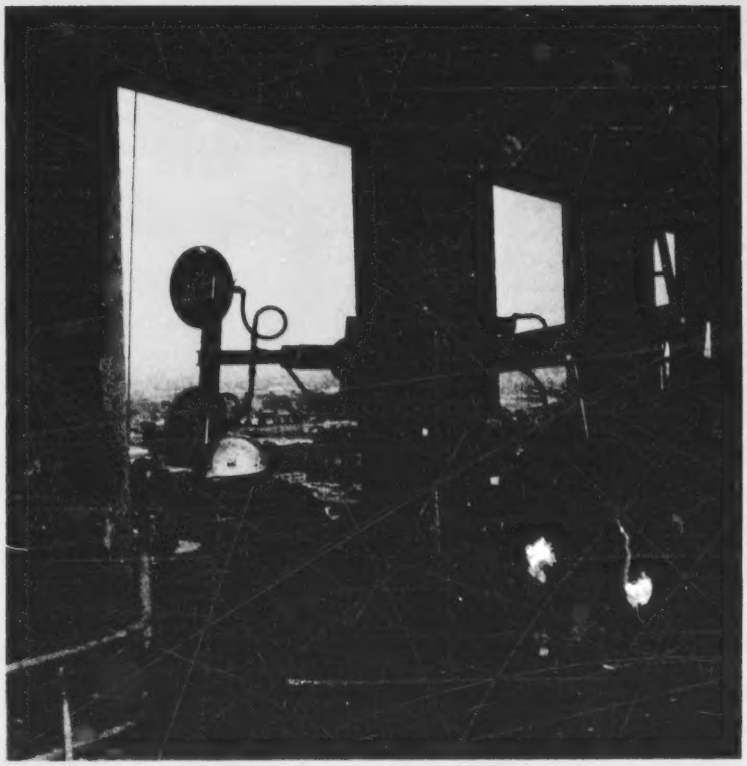
(D.O.T. 865.781)

Nature of the Work

Construction glaziers install plate glass, ordinary window glass, and special items such as leaded glass panels. To install windows, glaziers either cut the glass to size or use precut pieces. They apply putty to the window frames, press the glass into place, and secure it with wire clips or triangular metal points. They then place another strip of putty outside the window to keep out moisture.

Glaziers also install many kinds of structural glass, including shower doors and bathtub enclosures, mirrors of all types, and automatic glass doors. To install structural glass on walls and partitions, glaziers press glass into putty-like cement which has been applied to the supporting backing. They may use a cutter to trim glass which has not been precut.

Glaziers use handtools, such as glasscutters and putty knives, and power tools, such as cutters and grinders.



Places of Employment

About 9,000 persons worked as construction glaziers in 1974. Most worked for glazing contractors engaged in new construction, alteration, and repair. Others worked for government agencies or businesses that do their own construction work.

About 27,000 glaziers worked outside the construction industry. Many were employed in factories to install glass in windows, doors, and mirror frames. Others installed glass or mirrors in furniture or replaced automobile windshields and windows.

Glaziers work throughout the country, but jobs are concentrated in metropolitan areas. Glaziers occasionally may travel to work for a day or two in small outlying towns where few people, if any, are equipped and qualified to install glass in commercial buildings such as stores.

Training, Other Qualifications, and Advancement

The majority of construction glaziers learn the trade through a 4-year apprenticeship program. Others learn the trade informally on the job by assisting experienced workers.

Apprenticeship programs consist of on-the-job training, as well as 144 hours of classroom instruction each year. Some apprenticeship programs also require a comprehensive home study course.

On the job, apprentices learn to use the tools and equipment of the trade; handle, measure, cut, and install glass; cut and fit moldings; and install and balance glass doors. In the classroom, they are taught mathematics, blueprint reading,

general construction techniques, safety practices, and first-aid.

An applicant for a glazier's apprenticeship must be at least 18 years old, in good physical condition, and have a high school diploma or its equivalent. Courses in general mathematics, blueprint reading or mechanical drawing, general construction, and shop provide a helpful background.

Glaziers who have leadership ability may advance to supervisory jobs. Some glaziers become contractors.

Employment Outlook

Employment of construction glaziers is expected to increase faster than the average for all occupations through the mid-1980's. Besides the jobs resulting from employment growth, many openings will arise as experienced glaziers transfer to other occupations, retire, or die. The number of openings may fluctuate from year to year, however, because employment in this trade is sensitive to changes in construction activity.

Over the long run, population and business growth will create a rising demand for new residential and commercial buildings, such as apartments, offices, and stores. Since glass will continue to be popular in building design, the demand for glaziers also will grow. Moreover, the need to replace damaged glass will stimulate employment growth.

Employment opportunities should be greatest in metropolitan areas, where most glazing contractors are located.

Earnings and Working Conditions

Union construction glaziers in metropolitan areas had estimated average wages of $8.05 an hour in 1974, about the same as the average for all union building trades workers. Apprentice wage rates usually start at 50 percent of the rate paid to experienced glaziers and increase periodically.

Glaziers may be injured by glass edges or cutting tools, falls from scaffolds, or from lifting glass. To reduce injuries, employers and unions emphasize safety training.

Many glaziers employed in construction are members of the International Brotherhood of Painters and Allied Trades.

Sources of Additional Information

For more information about glazier apprenticeships or work opportunities, contact local glazing or general contractors; a local of the International Brotherhood of Painters and Allied Trades; a local joint union-management apprenticeship agency; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of glaziers, contact: International Brotherhood of Painters and Allied Trades, 1925 K St. NW., Washington, D.C. 20006.

LATHERS

(D.O.T. 842.781)

Nature of the Work

Lathers install supports that hold plaster, stucco, or concrete materials. These supports usually are either metal lath (strips of expanded metal or a metal wire mesh) or gypsum lath boards. Plaster, mixed properly, easily sticks to either type of lath.

When installing metal lath, the lathers first build a light metal framework (furring), which is fastened to the structural framework of the building. On many ceilings or walls, however, the lath is attached directly to the wood framework or partitions. In either method, the lath is secured to the framework by nailing, clipping, wire-tying, or machine stapling. As the lath is being installed, lathers cut openings for electrical outlets and piping. Gypsum lath boards are installed in much the same way. The method of installation varies slightly in other types of lath work. For example, when cornices or other ornamental plaster shapes are specified, the lather builds the framework that approximates the desired shape or form. Metal lath is then attached to the framework.

Lathers install wire mesh reinforcement in all inside angles and corners to prevent structural cracking. On outside or exposed corners, a metal reinforcement called a corner bead is attached for protection and strength.

When stucco (a mixture of portland cement and sand) is to be applied over wood framework, lathers install two layers of wire mesh, separated by a layer of felt, to act as a base.

The tools of the trade include drills, hammers, hacksaws, shears, wirecutters, hatchets, stapling machines, and powder- or power-actuated fastening devices.

Places of Employment

Most lathers—who numbered about 25,000 in 1974—work for lathing and plastering contractors on new residential, commercial, or

Lather wire-ties metal lath.

industrial construction. They also work on modernization and alteration jobs. A relatively small number of lathers are employed outside the construction industry; for example, some make the lath backing for plaster display materials or scenery. Some are self-employed.

Training, Other Qualifications, and Advancement

Most training authorities recommend apprenticeship as the best way to learn lathing. However, many lathers, particularly in small communities, have acquired skills informally, by working as helpers, observing or being taught by experienced lathers.

Depending on the local, apprenticeship programs last 2, 3, or 4 years. All programs include on-the-job training; some also include classroom instruction. On the job, apprentices learn to use the tools and materials of the trade. Initially, they work on simple tasks, such as nailing wood lath to wall partitions. With experience, they advance to more complex jobs, such as installing wire mesh on curved ceilings. Classroom instruction includes applied mathematics, blueprint reading, sketching, estimating, welding, and safety.

Generally, applicants for apprentice or helper must be at least 16 years old and in good physical condition. Apprenticeship applicants are usually required to have a high school or vocational school education, or the equivalent. Courses in general mathematics and mechanical drawing can provide a helpful background. Aptitude tests often are given to determine manual dexterity and mechanical ability.

Some experienced lathers may become supervisors. Others may be able to start their own lath contracting business.

Employment Outlook

Little or no change in lather employment is expected through the mid-1980's. A relatively small number of job openings, however, are expected due to the need to replace experienced lathers who will retire, die, or transfer to other occupations.

The use of drywall materials in place of plaster has reduced the demand for lathers in recent years. Nevertheless, lathers are still needed for renovating older buildings that have plaster walls. Plaster also is used in some of the more expensive new buildings and on curved surfaces where drywall materials cannot be used.

Earnings and Working Conditions

Union lathers in metropolitan areas had estimated average union wages of $8.60 an hour in 1974, slightly higher than the average for all union building trade workers. Hourly wage rates for apprentices usually start at 50 percent of the rate paid to experienced lathers and increase periodically.

Although lathers' work is not strenuous, it does require standing, squatting, or working overhead for long periods. Workers can be injured by falls from scaffolds or by cuts from various working materials or tools.

A large proportion of lathers are members of The Wood, Wire and Metal Lathers International Union.

Sources of Additional Information

For information about lathers' apprenticeships or other work opportunities in the trade, contact a local lathing or plastering contractor; a local of The Wood, Wire and Metal Lathers International Union; a local joint labor-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about the work of lathers, contact:

International Association of Wall and Ceiling Contractors, 1775 Church St. NW., Washington, D.C. 20036.

National Lathing Industries Joint Apprenticeship Program, 815 16th St. NW., Washington, D.C. 20006.

The Wood, Wire and Metal Lathers International Union, 815 16th St. NW., Washington, D.C. 20006.

MARBLE SETTERS, TILESETTERS, AND TERRAZZO WORKERS

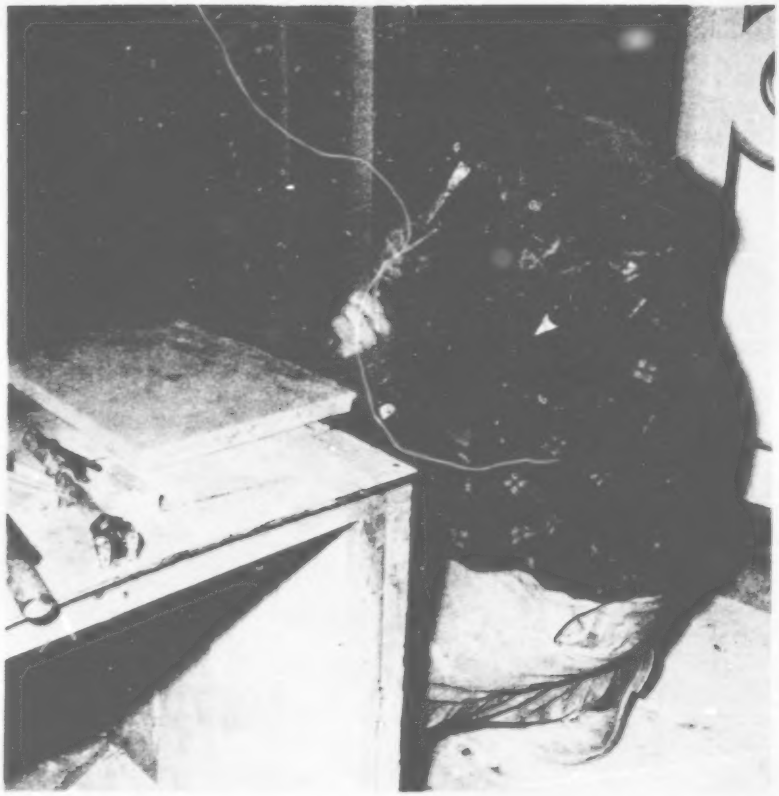
(D.O.T. 861.381 and .781)

Nature of the Work

Marble setters install marble, terrazzo panels, and structural glass in large buildings and other structures. Tilesetters attach tile to walls, floors, and ceilings. Terrazzo workers apply an ornamental concrete used mainly for floors in buildings such as stores, offices, and hospitals.

Marble is often used as a facing for concrete walls, columns, and floors. To set marble panels in a wall, marble setters drill holes in the edges of the marble and fasten anchors in the holes. They then apply a plaster mixture to the wall, set the marble, and anchor it in place. A special cement mixture is packed into the joints between the pieces and then finished with a trowel. Marble setters' helpers mix plaster and cement, carry marble slabs, and clean the completed work.

Tilesetters apply a cement-like coating to the wall, floor, or other surface that is to be covered with tile. In some cases, the coating is applied to the back of the tile. Tilesetters put each tile into place and tap it so that it will stick securely to the wall or floor. To fit the tile in corners or around pipes, they use chisels and other tools to shape each piece to proper size. Tilesetters usually are assisted by helpers who carry materials, mix cement, and cleanup after the job is finished.



Marble setter uses chisel to shape piece of marble.

Terrazzo is a tinted ornamental concrete with marble chips, and is used primarily for floors. Terrazzo workers lay a base of cement mortar and then level it with a long rod or straightedge. Metal strips are placed in the mortar base wherever there is to be a joint or change of color between panels. Terrazzo workers mix the top layer of cement and marble chips, pour it onto the the base, and then roll and level it. After the mixture has hardened for a few days, the terrazzo floor is ground and polished with a grinding machine.

Terrazzo workers are assisted by helpers who carry cement, sand, and other materials, and mix and pour base and terrazzo mixtures. Helpers also grind, polish, and clean floors.

Places of Employment

Marble setters, tilesetters, and terrazzo workers—who numbered about 40,000 in 1974—are employed mainly in nonresidential construction projects, such as schools, hospitals, and public and commercial buildings. A significant proportion of tilesetters—about 1 out of 5—are self-employed. Self-employment is less prevalent among marble and terrazzo workers.

Workers in these crafts are employed throughout the country but are found largely in the more populated urban areas.

Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of a 3-year apprenticeship program as the best way to learn each of these trades. A substantial proportion of tilesetters, terrazzo workers, and marble setters, however, acquire their skills informally by working as helpers and being taught by experienced workers.

The apprenticeship programs in each of these trades generally consist of on-the-job training and related classroom instruction in subjects such as blueprint reading, layout work, and basic mathematics.

When hiring apprentices or helpers, employers usually prefer high school or vocational school graduates who have had courses in general mathematics, mechanical drawing, and shop. Good physical condition, manual dexterity, and a good sense of color harmony also are important assests.

Skilled tile, terrazzo, or marble setters may become supervisors or start their own contracting businesses.

Employment Outlook

Employment of marble setters, terrazzo workers, and tilesetters is expected to increase more slowly than the average for all occupations through the mid-1980's. Although population and business growth will cause an increase in construction activity, growth in these crafts will be limited by the increasing use of competing materials, such as carpeting, paving brick, and plastic coated wallboard, which usually are installed by workers in other trades. Most job opportunities will result from the need to replace marble setters, terrazzo workers, and tilesetters who retire, die, or transfer to other occupations.

Earnings and Working Conditions

According to 1974 estimates of union wages in metropolitan areas,

hourly rates for marble setters averaged $8.45; for terrazzo workers, $8.20; and for tilesetters, $8.05. Hourly wage rates for apprentices start at about 50 to 60 percent of the rate paid to experienced workers and increase periodically.

Marble setters and terrazzo workers work both indoors and outdoors, depending on the type of installation. Tilesetters work mostly indoors.

The principal unions organizing these workers are the Bricklayers, Masons and Plasterers' International Union of America; and the International Association of Marble, Slate and Stone Polishers, Rubbers and Sawyers, Tile and Marble Setters' Helpers and Marble Mosaic and Terrazzo Workers' Helpers.

Sources of Additional Information

For details about apprenticeship or other work opportunities in these trades, contact local tile, terrazzo, and marble setting contractors; locals of the unions previously mentioned; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of marble setters, tilesetters, and terrazzo workers, contact:

Bricklayers, Masons and Plasterers' International Union of America, 815 15th St. NW., Washington, D.C. 20005.

International Association of Marble, Slate and Stone Polishers, Rubbers and Sawyers, Tile and Marble Setters' Helpers and Marble Mosaic and Terrazzo Workers' Helpers, 821 15th St. NW., Washington, D.C. 20005.

National Terrazzo and Mosaic Association, Inc., 716 Church St., Alexandria, Va. 22314.

Tile Contractors' Association of America, Inc., 112 North Alfred St., Alexandria, Va. 22314.

OPERATING ENGINEERS (CONSTRUCTION MACHINERY OPERATORS)

(D.O.T. 850.782 through .887, 851.883, 852.883, 853.782 and .883, 859.782 and 859.883)

Nature of the Work

Operating engineers are at the controls of bulldozers, cranes, trench excavators, paving machines, and many other types of construction machinery. Some of these workers know how to operate several kinds of machines; others only have the skills to operate a few.

Some machines are relatively simple to operate, while others such as earthmoving machines and cranes are complex and require coordination of many controls. The operation of large cranes requires a high degree of skill because operators must manipulate a number of pedals and levers to rotate the crane and raise and lower its boom and loadline. They also manipulate different kinds of equipment that can be attached to crane booms, such as buckets for lifting dirt and wrecking balls for demolishing old buildings. If not controlled properly, cranes can damage property and endanger other workers at the construction site, so operators must judge distances accurately and handle controls precisely. Earthmoving machines require much less skill. The operator sets the proper drill in the spindle, starts the machine, and stops its boring at the correct depth.

Operating engineers may lubricate their machines and make minor repairs and adjustments. Major repairs, however, usually are made by heavy-equipment mechanics

Places of Employment

An estimated 275,000 operating engineers were employed as excavating, grading, and road machinery operators in 1974. In addition, about 125,000 worked as bulldozer operators. Many operating engineers were employed on other construction machinery, including cranes, derricks, hoists, air-compressors, trench-pipe layers, and dredges.

Most operating engineers work for contractors in highway, dam, airport, and other large-scale construction projects. Others work for utility companies, manufacturers, and other business firms that do their own construction work, as well as State and local highway and public works departments. Less than one-tenth of all operating engineers are self-employed, a smaller proportion than in most building trades.

Some operating engineers are employed in factories and mines to control cranes, hoists, and other power-driven machinery.

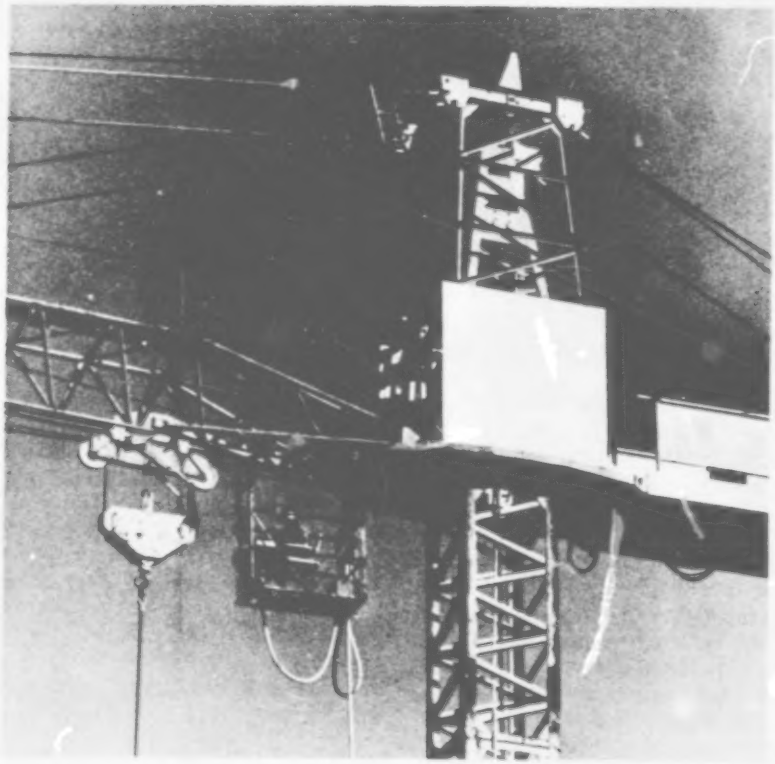
Operating engineers are employed in every section of the country, both in large cities and in small towns. Some work on highways and dams being built in remote locations.

Training, Other Qualifications, and Advancement

Although many operating engineers have learned their skills on the job without formal instruction, most training authorities recommend completion of a 3-year formal apprenticeship as the best way to become an operating engineer. Since apprentices learn to operate a variety of machines, they have better job opportunities. Less extensive training is available through the Armed Forces or through special heavy-equipment training schools.

The apprenticeship program consists of at least 3 years of on-the-job training, as well as 144 hours a year of related classroom instruction.

Under the supervision of ex-



Operating engineers must judge distance accurately and handle controls precisely.

perienced operating engineers, apprentices work as oilers or as helpers. Initial tasks include cleaning, greasing, repairing, and starting machines. Within a year, apprentices are usually given the opportunity to perform simple machine operations, such as light lifts with a crane. In time they receive less supervision and more responsibility. In the classroom, apprentices receive instruction in engine operation and repair, cable splicing, hydraulics, welding, and safety and first-aid.

For apprentice jobs, employers prefer to hire high school or vocational school graduates who are at least 18 years old. Courses in driver education and automobile mechanics provide a helpful background. Experience in operating tractors and other farm machinery also is helpful.

Operating engineers who have leadership ability may become supervisors, but opportunities are few. Some operating engineers start their own excavating and grading business.

Employment Outlook

Job opportunities for operating engineers should be fairly plentiful over the longrun. Employment in this occupation is expected to grow much faster than the average for all occupations through the mid-1980's. Population and business growth will lead to the construction of more factories, mass transit systems, office buildings, power plants, and other structures, thereby increasing the demand for operating engineers. More operating engineers also will be needed in other areas, such as maintenance on highways and materials movement in factories and mines.

Besides the job openings created by employment growth, many openings will arise as experienced operating engineers retire, die, or transfer to other occupations. Jobs should be easiest to find during spring and summer since construction picks up as the weather becomes warmer. However, because construction activity is sensitive to ups and downs in the economy, the number of job openings may fluctuate from year to year.

Earnings and Working Conditions

Wage rates for operating engineers vary according to the machine operated. According to 1974 estimates of union wages in metropolitan areas, hourly rates for crane operators averaged $8.40; for bulldozer operators, $8.25; and for air-compressor operators, $7.35. Annual earnings, however, may not be as high as the hourly wage rates would indicate because some worktime may be lost due to bad weather and occasional unemployment between jobs. Hourly wage rates for apprentices start at about 70 percent of the full rate paid to experienced workers and increase periodically.

Operating engineers work outdoors; consequently, they usually work steadily during the warmer months and experience slow periods during the colder months. Time also may be lost due to rain or snow. The operation of some machines, particularly bulldozers and some types of scrapers, is physically tiring because the constant movement of the machine shakes or jolts the operator.

Many operating engineers are members of the International Union of Operating Engineers.

Sources of Additional Information

For further information about ap-

prenticeships or work opportunities in this occupation, contact a local of the International Union of Operating Engineers; a local joint apprenticeship committee; or the nearest office of the State apprenticeship agency. In addition, the local office of the State employment service may provide information about apprenticeship and other programs that provide training opportunities.

For general information about the work of operating engineers, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006

International Union of Operating Engineers 1125 17th St. NW., Washington, D.C. 20036

PAINTERS AND PAPERHANGERS

(D.O.T. 840.381, .781 and .844, and 841.781)

Nature of the Work

Painting and paperhanging are separate, skilled trades, although many people do both types of work. Painters apply paint, varnish, and other finishes to building surfaces to decorate or protect them. Paperhangers cover walls and ceilings of rooms with decorative wallpaper, fabric, vinyl, or similar materials.

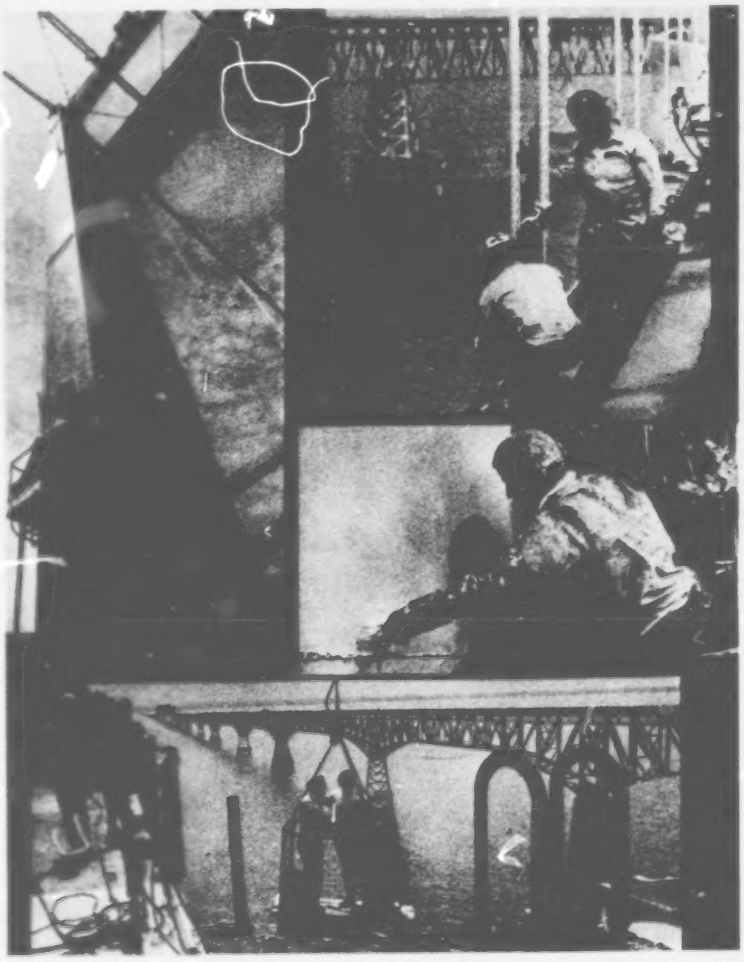
One of the primary duties of painters is to prepare the surface to be painted. They remove loose paint by scraping, or by heating with a blowtorch and then scraping. They also remove dust and grease, fill nail holes and cracks, sandpaper rough spots, and brush off dust. When painting new surfaces, they usually cover them with a prime sealer or coat to make a suitable surface or base for the finish coat.

Painters must be skilled in handling brushes and other painting tools so that they can apply paint thoroughly, uniformly, and rapidly to any type of surface. They must be able to mix paints and match colors, using a knowledge of paint composition and color harmony. They also must know the characteristics of common types of paints and finishes from the standpoints of durability, suitability, and ease of handling and application.

Painters often use rollers or spray guns instead of brushes. Rollers are used on even surfaces such as walls and ceilings. Spray guns are used on surfaces that are difficult to paint with a brush, such as cinder block and metal fencing. Both rollers and spray guns permit faster painting.

Painters also erect scaffolding, including "swing stages" (scaffolds suspended by ropes or cables attached to roof hooks) and "bosun chairs," which they use when working on tall buildings and similar structures.

The first step in paperhanging is to prepare the surface to be covered. Paperhangers apply "sizing," a prepared material that makes the surface to be prepared less porous and assures better sticking of the paper. In doing redecorating work, they may have to remove old paper by soaking or—if there are many layers—by steaming. Frequently, it is necessary for paperhangers to do minor plaster patching.



Paperhangers measure the area to be covered and cut a length from the roll of wallpaper, after carefully positioning the patterns to match at the ceiling and baseboard. They then apply paste to the strip of paper, place it on the wall, and smooth it by hand or with a brush. They cut and fit edges at the ceiling and base, and smooth seams between strips with a roller or other special tool. They inspect the paper for air bubbles and other imperfections in the work. Air bubbles are removed by smoothing the paper strip toward the outer edges. When working with wall coverings other than paper, such as fabric or vinyl, paperhangers follow the same general procedure.

Places of Employment

About 450,000 painters and 20,000 paperhangers were employed in 1974. Many worked for contractors engaged in new construction, repair, alteration, or modernization work. Hotels, office buildings, shipyards, manufacturing firms, schools, and other organizations that own or manage extensive property holdings also employed maintenance painters.

A high proportion of workers in these trades were in business for themselves. About one-fourth of the painters and more than half of the paperhangers were self-employed. In comparison, only one-tenth of all building trades workers were self-employed.

Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of a formal apprenticeship as the best way to become a painter or paperhanger. Many people, however, learn the trades informally, working as helpers to experienced painters and paperhangers.

The apprenticeship for painters and paperhangers generally consists of 3 years of on-the-job training, in addition to 144 hours of related classroom instruction each year. Apprentices receive instruction in subjects such as color harmony; paint chemistry; cost estimating; paint mixing and matching; and safety. They also learn the relationship between painting and paperhanging and the work performed by the other building trades. Many apprenticeships combine painting and paperhanging.

Applicants for apprentice or helper jobs generally must be at least 16 years old and in good physical condition. A high school or vocational school education is preferred, although not essential. Courses in chemistry and general shop are useful. Applicants should have manual dexterity and a discerning color sense. They cannot be allergic to fumes from paint or other materials used in these trades.

Painters and paperhangers may advance to jobs as cost estimators for painting and decorating contractors. Some may become superintendents on large contract painting jobs, or they may establish their own painting and decorating businesses.

Employment Outlook

Employment of painters is expected to grow more slowly than the average for all occupations through the mid-1980's. Replacement needs will create more job openings than growth. Many new workers will be hired to replace experienced painters who retire, die, or leave their jobs for other reasons. The number of job openings, however, may vary greatly from year to year because the demand for painters is sensitive to changes in economic conditions, particularly fluctuations in construction activity.

Over the long run, population and business growth will create a rising demand for new houses and buildings and more workers will be needed to paint these structures. Additional workers also will be hired to repaint existing structures, even though improved methods of applying paint, which make it easier for homeowners to do their own repainting, may limit employment growth.

Employment of paperhangers is expected to increase about as fast as the average for all occupations through the mid-1980's. The demand for these workers should be stimulated by the rising popularity of wallpaper and more durable wall coverings such as vinyl. Since this is a relatively small trade, however, job openings for paperhangers will be far less numerous than those for painters.

Earnings and Working Conditions

Based on a survey of metropolitan areas, union hourly rates for painters and paperhangers averaged about $8.10 in 1974. In comparison, the average rate for experienced union workers in all union building trades was $8.16 an hour. The annual incomes for some painters, particularly those on outside jobs, may not be as high as hourly rates would indicate because some worktime is lost due to bad weather and occational unemployment between jobs.

Hourly wage rates for apprentices usually start at 50 percent of the rate paid to experienced workers and increase periodically until the full rate of pay is reached at the completion of apprenticeship. Painters and paperhangers must stand for long periods. Their jobs also require a considerable amount of climbing and bending. A painter must have strong arms because much of the work is done with arms raised overhead. Painters and paperhangers risk injury from slips or falls off ladders and scaffolds. However, the injury rate for employees of painting, paperhanging, and decorating contractors in the

construction industry has been significantly lower than the average for contract construction as a whole.

A large proportion of painters and paperhangers are members of the International Brotherhood of Painters and Allied Trades. A few are members of other unions.

Sources of Additional Information

For details about painting and paperhanging apprenticeships or other work opportunities in these trades, contact local painting and decorating contractors; a local of the International Brotherhood of Painters and Allied Trades; a local joint union-management apprenticeship committee; or the nearest office of the State apprenticeship agency or State employment service.

For general information about the work of painters and paperhangers, contact:

International Brotherhood of Painters and Allied Trades, 1925 K St. NW., Washington, D.C. 20006

Painting and Decorating Contractors Association of America, 2625 West Peterson Ave., Chicago, Ill. 60605.

PLASTERERS

(D.O.T. 842.381 and .781)

Nature of the Work

Plasterers finish interior walls and ceilings with plaster coatings that form fire-resistant and relatively soundproof surfaces; they apply durable cement plasters or stucco to exterior surfaces. Plasterers also cast ornamental designs in plaster.

In interior work, these workers usually apply three distinct coats of plaster—scratch, brown, and finish. They apply an initial or scratch coat directly to either metal or gypsum lath (backing to which plaster readily adheres) and then scratch this coat with a special raking tool before it hardens. The raking helps the next coat stick. When the plaster has set sufficiently, the brown coat or second layer of plaster is applied. Plasterers straighten and float this second layer with various plastering tools to prepare the surfaces for final finishing. The finish coat, usually a white lime mixture, is a thin covering that plasterers must apply quickly and finish smoothly with trowel, brush, and water. Often, instead of a smooth coat, they make a variety of decorative textures, such as swirl, stipple (dots), and sand finishes, by floating or skip troweling.

For exterior cement plaster or stucco work, plasterers apply an initial or scratch coat to wire lath in the same way as they plaster interior surfaces. The finish coat is usually a mixture of white cement and sand or another finish material. Marble or gravel chips, for example, may be imbedded into the soft plaster to form a textured surface.

Plasterers sometimes do complex decorative and ornamental work. For example, they may mold intricate designs for the walls and ceilings of public buildings. Plasterers who do this work must follow blueprints and other specifications furnished by architects.

Plasterers use many special tools. They hold the plaster mixture on a hawk (a light metal plate with a handle) and apply the wet mixture with a trowel. Smoothing and finishing are done with straightedges, beveledges, rods, floats, and other handtools. They also may use spray machines to apply plaster on both base and finish coats.

Apprentices work directly with experienced plasterers to acquire their skills. Laborers or helpers mix and carry materials for plasterers. They also set up scaffolding.

Places of Employment

Plasterers—who numbered about 26,000 in 1974—worked mostly on new construction. Many also did alteration work, particularly where special architectural and lighting effects were part of the building modernization. Some plasterers repaired older buildings.

About 1 out of every 5 plasterers was self-employed.

Training, Other Qualifications, and Advancement

Most training authorities recommend completion of an apprenticeship as the best way to learn plastering. However, many beginners have learned the trade by working as helpers or laborers, observing and being taught by experienced plasterers.

Apprenticeship programs generally consist of 3 or 4 years of on-the-job training, in addition to at least 144 hours of annual classroom instruction in drafting, blueprint reading, and mathematics for layout work.

Applicants for apprentice or helper jobs generally must be at least 17 years old, in good physical condition, and have manual dexterity. Applicants who have a high school or vocational school education are preferred. Courses in general mathematics, mechanical drawing, and shop provide a useful background.

Plasterers may advance to supervisor, superintendent, or estimator for plastering contractors, or may become self-employed.

Employment Outlook

Little change is expected in the employment of plasterers through the mid-1980's. Nevertheless, a relatively small number of job openings will result from the need to replace experienced workers who retire, die, or transfer to other occupations.

The use of drywall materials in place of plaster has reduced the demand for plasterers in recent years. Nevertheless, plasterers are still

needed for renovating older buildings that have plaster walls. Plaster is also used in some of the more expensive new buildings and on curved surfaces where drywall materials cannot be used.

Earnings and Working Conditions

Based on a survey of metropolitan areas, union wage rates for plasterers averaged $8.32 an hour in 1974, compared with $8.16 for union workers in all building trades. Apprentice wage rates start at about half the rate paid to experienced plasterers and increase periodically.

Plastering requires considerable standing, stooping, and lifting. Plasterers work outdoors when applying stucco but most jobs are indoors.

A large proportion of plasterers are members of unions. They are represented by either the Operative Plasterers' and Cement Masons' International Association of the United States and Canada, or the Bricklayers, Masons and Plasterers' International Union of America.

Sources of Additional Information

For information about apprenticeships or other work opportunities, contact local plastering contractors; locals of the unions previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State apprenticeship agency or the State employment service.

For general information about the work of plasterers, contact:

Bricklayers, Masons and Plasterers' International Union of America, 815 15th St. NW., Washington, D.C. 20005.

International Association of Wall and Ceiling Contractors, 1775 Church St. NW., Washington, D.C. 20036.

International Council for Lathing and Plastering, 221 North LaSalle St., Chicago, Ill. 60601.

Operative Plasterers' and Cement Masons' International Association of the United States and Canada, 1125 17th St. NW., Washington, D.C. 20036.

Plasterers finish ceiling.

PLUMBERS AND PIPEFITTERS

(D.O.T. 862.381)

Nature of the Work

Plumbers and pipefitters install pipe systems that carry water, steam, air, or other liquids or gases. They also alter and repair existing pipe systems and install plumbing fixtures, appliances, and heating and refrigeration units.

Although plumbing and pipefitting are sometimes considered a single trade, workers can specialize in either craft. Plumbers install water, gas, and waste disposal systems in homes, schools, factories, and other buildings. Plumbers initially "rough in" (install) the pipe system as the building progresses; during the final construction stages they install the heating and air-conditioning units and connect radiators, water heaters, and plumbing fixtures such as bathtubs and sinks. Pipefitters install both high- and low-pressure pipes that carry hot water, steam, and other liquids and gases. For example, pipefitters install the complex pipe systems in oil refineries and chemical processing plants.

Some plumbers and pipefitters specialize in gas, steam, or sprinkler fitting. Gasfitters install and maintain the fittings and extensions that connect gasline mains with the lines leading to homes. Steamfitters assemble and install steam or hot

water systems for commercial and industrial uses. Sprinkler fitters install and maintain the piping for fire extinguishing systems.

Plumbers and pipefitters use wrenches, reamers, drills, braces and bits, hammers, chisels, saws, and other handtools. Power machines often are used to cut, bend, and thread pipes. Hand-operated hydraulic pipe benders also are used. In addition, plumbers and pipefitters use gas or acetylene torches and welding, soldering, and brazing equipment.

Places of Employment

Most plumbers and pipefitters—who numbered about 375,000 in 1974—work for plumbing and pipefitting contractors engaged in new construction activity, and work mainly at the construction site. A substantial proportion of plumbers are self-employed or work for plumbing contractors doing repair, alteration, or modernization work. Some plumbers install and maintain pipe systems for government agencies and public utilities, and some work on the construction of ships and aircraft. Others do maintenance work in industrial and commercial buildings. Pipefitters, in particular, are employed as maintenance personnel in the petroleum, chemical, and food-processing industries where manufacturing operations include the processing of liquids and gases through pipes.

Plumbing is one of the highest paying building trades.

Training, Other Qualifications, and Advancement

Most training authorities recommend a formal apprenticeship for plumbers or for pipefitters as the best way to learn all aspects of these trades. A large number of people however, have learned these trades by working for several years as helpers to experienced plumbers and pipefitters, and observing and receiving instruction from them.

Most apprenticeship programs for plumbers and pipefitters are sponsored through union-management agreements and usually consist of 5 years of on-the-job training, in addition to at least 144 hours of related classroom instruction annually. On the job, apprentices learn to use the tools, machines, equipment, and materials of the trade. Classroom instruction covers subjects such as drafting and blueprint reading, mathematics applicable to layout work, applied physics and chemistry, and local building codes and regulations.

Applicants for apprentice or helper jobs are generally required to be at least 16 years old and in good physical condition. A high school or vocational school education is generally recommended. Courses in chemistry, general mathematics, mechanical drawing, physics, and shop are helpful. Applicants may be given tests to determine whether they have the mechanical aptitude required in these trades. To obtain a plumber's or pipefitter's license, which some communities require, an apprentice must pass a special examination to demonstrate knowledge of the trade and of the local building codes.

Some plumbers and pipefitters may become supervisors for plumbing and pipefitting contractors. Many go into business for themselves. As they expand their activities, they may employ other workers and become contractors. In most localities, contractors are required to obtain a master plumber's license.

Employment Outlook

Employment of plumbers and pipefitters is expected to grow faster than the average for all occupations through the mid-1980's. Thousands of job openings are expected because of employment growth and the need to replace plumbers and pipefitters who retire, die, or stop working for other reasons.

Employment is expected to grow mainly as a result of the anticipated increase in construction activity. Furthermore, plumbing will become more important in many types of construction. For example, many homes will have air-conditioning and appliances such as washing machines and kitchen waste-disposal equipment. Chemical and petroleum refineries and coal gasification and nuclear powerplants, which use extensive pipework in their processing activities, are expected to expand, thus creating additional jobs for plumbers and pipefitters. Maintenance, repair, and modernization of existing plumbing or piping systems also will create employment opportunities.

Growth in these trades is expected to be fairly steady in the years ahead. Employment of plumbers and pipefitters is less sensitive to ups and downs in construction activity than are most other building trades.

Earnings and Working Conditions

According to a survey of metropolitan areas, union wage rates for plumbers and for pipefitters averaged $9 an hour in 1974, compared with $8.16 an hour for union workers in all building trades. Annual earnings of workers in these fields are among the highest in the building trades because plumbing and pipefitting are affected less by bad weather and fluctuations in construction activity than are most other building trades.

Apprentice wage rates start at from 40 to 50 percent of the rates paid to experienced workers and increase periodically.

Plumbing and pipefitting work is active and sometimes strenuous. These workers frequently must stand for long periods and occasionally work in cramped or uncomfortable positions. They risk the danger of falls from ladders, cuts from sharp tools, and burns from hot pipes. The injury rate for employees of plumbing, heating, and air-conditioning contractors in the construction industry has been about the same as the average for contract construction as a whole, but higher than the average for manufacturing.

Many plumbers and pipefitters are members of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada.

Sources of Additional Information

For information about apprenticeships or work opportunities in these trades, contact local plumbing, heating, and air-conditioning contractors; a local of the union mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For general information about the work of plumbers, pipefitters, and sprinkler fitters, contact:

National Association of Plumbing-Heating-Cooling Contractors, 1016 20th St. NW., Washington, D.C. 20036.

National Automatic Sprinkler and Fire Control Association, 277 Park Ave., New York, N.Y. 10007.

United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada, 901 Massachusetts Ave. NW., Washington, D.C. 20001.

ROOFERS

(D.O.T. 804.281, 843.844, and 866.381)

Nature of the Work

Roofers apply composition roofing and other materials, such as metal and tile, to the roofs of buildings. They also waterproof and dampproof walls and other building surfaces.

To apply composition roofing, roofers first place strips of asphalt or tarred felt over the entire surface. They then apply a coating of tar, asphalt, or other tarlike material. This process is repeated until at least three layers of felt are in place. Finally, they apply asphalt or gravel-and-tar surfacing to protect the roofing materials from weather.

Other types of composition roofing, such as roll roofing and asphalt shingles, are overlapped and fastened to the roof with nails or asphalt cement. If necessary, material is cut to fit corners, pipes, and chimneys. Wherever two roof surfaces intersect, roofers cement or nail flashing (strips of felt or metal) over the joints to make them watertight.

Roofers also use metal, tile, and slate. They build metal roofs by soldering together metal sheets and nailing them over the wood sheathing. To install tile and slate roofs, they place a covering of felt over the wood sheathing, punch holes in the slate or tile, and nail it to the sheathing. Each row of slate or tile overlaps the preceding row. Finally, roofers cover exposed nailheads with cement to prevent rust and water leakage. They use handtools such as hammers, roofing knives, mops, and calking guns.

Roofers also waterproof and dampproof masonry and concrete walls and floors. To prepare surfaces for waterproofing, they remove rough spots with a hammer and chisel or rubbing brick before applying a coat of liquid waterproofing compound with a brush. They also may paint or spray surfaces with a waterproofing material or nail waterproofing fabric to surfaces. When dampproofing, they usually spray a coating of tar or asphalt on interior or exterior surfaces.

Places of Employment

About 90,000 roofers were employed in 1974. Most worked for roofing contractors on construction or repair jobs. Some worked for businesses and government agencies that do their own construction and repair work. A few roofers were self-employed.

Training, Other Qualifications, and Advancement

Most training authorities recom-

mend completion of a 3-year apprenticeship program as the best way to learn this trade. The program generally consists of a minimum of 1,400 hours of on-the-job training annually, in addition to 144 hours of classroom instruction in subjects such as blueprint reading, mathematics, and safety. The majority of workers, however, acquire roofing skills informally by working as roofers' helpers rather than through apprenticeship programs.

For those interested in becoming roofers, a high school education or its equivalent is helpful, as are courses in mechancial drawing and basic mathematics. Good physical condition and a good sense of balance also are important assets. Applicants for apprenticeship programs usually must be at least 18 years old.

Roofers may advance to supervisor or to superintendent for a roofing contractor. Also, they may enter business for themselves and hire other roofers.

Employment Outlook

Employment of roofers is expected to increase faster than the average for all occupations through the mid-1980's. More roofers will be needed due to the longrun increase in construction activity. New construction and repairs on existing roofs will provide most of the work opportunities. Dampproofing and waterproofing, however, will provide an increasing proportion of roofers' work. Besides the job openings resulting from employment growth, some openings will arise from the need to replace experienced roofers who retire, die, or stop working for other reasons. Because construction activity fluctuates, however, job openings may be plentiful in some years, scarce in others. Jobs should be easiest to find during spring and summer since roofing work picks up as the weather becomes warmer.

Earnings and Working Conditions

Union roofers in metropolitan areas had estimated average wages of $8.10 an hour in 1974, about the same as the average for all union building trades workers. Since roofing work is somewhat seasonal and time may be lost due to bad weather and occasional unemployment between jobs, annual earnings may not be as high as hourly rates of pay would indicate.

Apprentices usually start at 65 percent of the skilled roofer's pay rate and receive increases periodically.

Roofers' work is sometimes strenuous. It involves a lot of standing, as well as climbing, bending, and squatting. Roofers risk injuries from slips or falls from scaffolds or roofs, and may have to be outdoors in all types of weather, particularly when making repairs. The work may be especially hot during the warmer months.

Many roofers are members of the United Slate, Tile and Composition Roofers, Damp and Waterproof Workers Association.

Sources of Additional Information

For information about roofing apprenticeships or work opportunities in this trade, contact local roofing contractors; a local of the union previously mentioned; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or State apprenticeship agency.

For information about the work of roofers, contact:

National Roofing Contractors Association, 1515 N. Harlem Ave., Oak Park, Ill. 60302.

SHEET-METAL WORKERS

(D.O.T. 804.281 and .884)

Nature of the Work

Sheet-metal workers on construction jobs fabricate and install ducts for ventilating, air-conditioning, and heating systems. They also fabricate and install many other sheet-metal products, such as roofing, siding, and neon signs. These workers generally are more skilled than the assembly-line factory workers who also make sheet-metal products but can perform only a few operations.

In heating and air-conditioning duct work, sheet-metal workers plan the job to determine the size and type of metal needed before cutting it with hand snips, power-driven shears, and other tools. They shape the metal with machines, hammers, and anvils, then weld, bolt, rivet, solder, or cement the seams and joints. Some ducts are readymade and require little fabrication at the worksite. To install ducts, components are fitted together, hangers and braces are installed for support, and joints are connected and soldered or welded. Some sheet-metal workers specialize in either shopwork or onsite installation; others do both.

Places of Employment

Sheet-metal workers in the construction industry—who numbered about 65,000 in 1974—are employed mainly by contractors who specialize in heating, refrigeration, and air-conditioning equipment, and by general contractors engaged in residential, industrial, and commercial building. Additional sheet-metal workers are employed by government agencies or businesses that do their own construction and alteration work. Very few are self-employed.

Besides those in construction jobs, thousands of skilled sheet-metal workers are employed in the railroad, aircraft, and shipbuilding industries. Many others work in small shops that manufacture specialty products, such as custom kitchen equipment for hotels and restaurants. Firms that make

blowers, exhausts, electrical equipment, food products machinery, and turbines also employ sheet-metal workers.

Sheet-metal workers are employed throughout the country, but jobs are concentrated in metropolitan areas.

Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of an apprenticeship program as the best way to learn the sheet-metal trade. Many sheet-metal workers, however, have acquired these skills by working as helpers, observing and being taught by experienced workers.

The apprenticeship program usually consists of 4 years of on-the-job training, in addition to related classroom instruction. On the job, apprentices learn to use the tools, machines, equipment, and materials of the trade. Classroom instruction covers subjects such as drafting, blueprint reading, mathematics, and safety and first-aid. In addition, apprentices learn the relationship between sheet-metal work and other building trades.

Applicants for jobs as apprentices or helpers should be in good physical condition and have mechanical aptitude. Apprentices must have a high school or vocational school education. Courses in mathematics, mechanical drawing, and shop provide a helpful background for learning the trade.

Sheet-metal workers in construction may advance to supervisory jobs or may go into the contracting business.

Employment Outlook

Employment of sheet-metal workers in construction is expected to increase about as fast as the average for all occupations through the mid 1980's. In addition to jobs from employment growth, many openings will arise as experienced workers retire, die, or leave work for other reasons.

As population and business grow, more sheet-metal workers will be needed to install air-conditioning and heating duct work and other sheet-metal products in new houses, stores, offices, and other buildings. The demand for air-conditioning systems in older buildings also will speed employment growth.

Athough employment is expected to increase over the long run, job openings may fluctuate from year to year due to ups and downs in construction activity. When construction activity is depressed, jobs for sheet-metal workers may be available in other industries.

Earnings and Working Conditions

Union sheet-metal workers in metropolitan areas had estimated average wages of $8.95 an hour in 1974, slightly higher than the average for all union building trades workers. Sheet-metal apprentices generally start at 45 percent of the rate paid to experienced workers and receive periodic pay raises.

Many sheet-metal workers spend considerable time at the construction site, working either indoors or outdoors. Others work primarily in shops doing fabricating and layout work.

When installing gutters and skylights, they work high above ground. When installing ventilation and air-conditioning systems, they may work in awkward and cramped positions. Sheet-metal workers risk cuts and burns from materials and tools. The injury rate for workers in this trade is higher than the average for all construction workers.

A large proportion of sheet-metal

workers are members of the Sheet Metal Workers' International Association.

Sources of Additional Information

For more information about apprenticeships or other work opportunities, contact local sheet-metal contractors or heating, refrigeration, or air-conditioning contractors; a local of the union mentioned above; a local joint union-management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about sheet-metal workers, contact:

Sheet Metal and Air Conditioning Contractors' National Association, Inc., 1611 N. Kent St., Arlington, Va. 22209.

Sheet Metal Workers' International Association, 1000 Connecticut Ave. NW., Washington, D.C. 20036.

STRUCTURAL, ORNAMENTAL, AND REINFORCING IRONWORKERS; RIGGERS; AND MACHINE MOVERS

(D.O.T. 801.281, .381, .781, .884; 809.381, .781, .884; and 869.883)

Nature of the Work

Ironworkers erect steel framework and other metal parts in buildings, bridges, and other structures. They also rig heavy construction machinery (prepare it for moving) and deliver the machinery to new sites. In addition, ironworkers make alterations, such as installing steel stairs or adding window guards to buildings, and do repair work, such as replacing metal bridge parts.

Ironworkers comprise four related trades—structural ironworkers, riggers and machine movers, ornamental ironworkers, and reinforcing ironworkers. Many ironworkers are skilled in two of these trades or more.

Structural ironworkers (D.O.T. 809.381) erect the steel framework of bridges, buildings, and other structures such as storage tanks. They also install floor decking and the doors and frames of bank vaults. In erecting steel framework, they push, pull, or pry steel beams and girders into proper position. Next, they temporarily connect all steel members with bolts, use plumb bobs and levels to align the structure, and then weld or bolt the pieces. In a large building, ironworkers generally specialize in a particular operation, such as welding or bolting.

Riggers and machine movers (D.O.T. 869.883) set up and rig the hoisting equipment used to erect and dismantle structural steel frames. These skilled workers also move heavy construction machinery and equipment. They study the size, shape, and weight of the object to be moved, choose lines and cables to support the load, and select points of attachment that will provide a safe and secure hold on the load. Next, they attach the lifting device to both the hoisting equipment and the item to be moved, and direct the load into position by giving hand signals and other directions to the hoisting machine operator. In many instances, special rigging equipment must be built on the job to move unusually shaped materials and machines. This work requires a knowledge of hoisting equipment and lifting devices.

Ornamental ironworkers (D.O.T. 809.381) install metal stairways, catwalks, floor gratings, ladders, and window frames. They also install lampposts, fences, and decorative ironwork. In addition, they work with prefabricated aluminum, brass, and bronze items. Examples are recently developed ornamental building facades which are bolted or welded to a building.

Reinforcing ironworkers (D.O.T. 801.884) set steel rods or bars in concrete forms to reinforce the concrete. They place the steel bars on suitable supports in the concrete form and tie the bars together at intersections so that each bar receives its intended structural load. The bars are placed in the form according to blueprints, specifications, or verbal instruction. Workers use steel pliers and other tying tools to wire the rods securely in place. Some concrete is reinforced with a coarse mesh made of welded wire. When using mesh, they measure the surface to be covered, cut and bend the mesh to the desired shape, and place it over the area to be reinforced. While a concrete crew pours the slab, ironworkers use hooked rods to position the wire mesh in the freshly poured mixture.

Places of Employment

About 85,000 structural and ornamental ironworkers were employed in 1974. Thousands of additional workers were employed as riggers, machine movers, and reinforcing ironworkers.

Most of these workers are employed by general contractors on large building projects, steel erection contractors, or ornamental iron contractors. Many are employed by large steel companies or their subsidiaries engaged in the construction of bridges, dams, and large buildings. Some work for government agencies, public utilities, or large industrial firms that do their own construction work. Very few are self-employed.

Ironworkers work in all parts of the country, but they are concentrated in metropolitan areas.

Training, Other Qualifications, and Advancement

Most training authorities recommend the completion of an apprenticeship as the best way to learn these trades. The apprenticeship program for ironworkers usually consists of 3 years of on-the-

Reinforcing iron worker ties metal rods in place.

job training and a minimum of 144 hours a year of classroom instruction in subjects such as drafting, blueprint reading, and mathematics applicable to layout work.

Applicants for apprenticeship generally must be at least 18 years old and have a high school or vocational school education; courses in general mathematics and mechanical drawing provide a helpful background.

Since materials used in ironworking trades are heavy and bulky, above-average physical strength is necessary. Agility and a good sense of balance also are required in order to work at great heights and on narrow footings.

Experienced ironworkers can advance to supervisory positions. A small number go into the ironworking business.

Employment Outlook

Employment of ironworkers is expected to increase faster than the average for all occupations through the mid-1980's. Growth in construction activity will increase the demand for these workers. Besides jobs resulting from employment growth, many openings will result from the need to replace experienced ironworkers who transfer to other fields of work, retire, or die. The number of job openings may fluctuate from year to year, however, because construction activity is sensitive to changes in the economy.

Employment in all ironworking occupations is expected to increase over the long run. The growing use of structural steel in buildings will create a need for more structural ironworkers. Work opportunities for ornamental ironworkers will result from the growing popularity of ornamental panels for large buildings, and of metal frames to hold large glass installations. More riggers and machine movers will be needed to handle the increasing amount of heavy construction machinery. The growing demand for prestressed concrete will create additional job opportunities for reinforcing ironworkers.

Job openings for ironworkers are usually more abundant during the early spring when the weather warms up and the level of construction activity increases.

Earnings and Working Conditions

Union structural and reinforcing ironworkers in metropolitan areas had estimated average wages of $8.65 an hour in 1974, slightly higher than the average for all union building trades workers. Annual earnings for these workers, however, may not be as high as hourly wages would indicate because some worktime is lost due to bad weather and occasional unemployment between jobs.

Hourly wage rates for apprentices start at 60 percent of the rate paid to experienced workers and increase periodically.

Although many ironworkers risk injury from falls, safety devices such as nets, safety belts, and scaffolding have helped prevent accidents.

Ironwork can involve considerable travel because demand may be insufficient to keep local crews continually employed.

Many workers in these trades are members of the International Association of Bridge, Structural and Ornamental Iron Workers.

Sources of Additional Information

For more information on apprenticeships or other work opportunities, contact local general contractors; a local of the union mentioned above; a local joint union management apprenticeship committee; or the nearest office of the State employment service or apprenticeship agency.

For general information about ironworkers, contact:

Associated General Contractors of America, Inc., 1957 E St. NW., Washington, D.C. 20006.

OCCUPATIONS IN TRANSPORTATION ACTIVITIES

Transportation offers a wide range of career opportunities. Jobs in air, rail, highway, and water transportation vary from those that require little education to those technical positions that require at least a college degree.

Although this field includes a variety of jobs, most workers drive trucks and buses, fly for airlines, operate trains and ships, or keep this equipment in good working condition. Some examples of these workers are locomotive engineers, airplane pilots, and truckdrivers; and track maintenance workers, airplane mechanics, and truck mechanics. Employees who provide services for customers, such as flight attendants and reservation agents, account for most of the remaining transportation jobs.

As our economy expands and population grows, demand for freight and passenger service will rise, and more transportation workers will be needed. Employment trends, however, will vary by type of business. Employment in most air and highway transportation jobs will increase, while employment in the merchant marine and many jobs on railroads will decline. Even in most declining occupations, however, new workers will be hired to replace those who retire, die, or transfer to other fields.

The transportation occupations mentioned in this introduction, as well as many more, are described in detail in the following sections.

AIR TRANSPORTATION OCCUPATIONS

More than 450,000 workers helped operate the Nation's fleet of civilian aircraft in 1974. Some, like pilots, flew on them as crew members, while mechanics made sure all equipment operated properly. Others took passenger reservations and sold tickets. Still others, like air traffic controllers, helped direct the planes.

Air transportation offers excellent opportunities for persons with varied types of skills and training. Working conditions are generally good and the pay is fairly high. Many employees travel and meet interesting people.

Through the mid-1980's, employment in air transportation occupations as a whole is expected to grow as the number of planes increases. In addition to those employed because of this growth, many new employees will be hired to replace those who retire, die, or stop working for other reasons.

The individual statements that follow cover airplane pilots, flight attendants, airplane mechanics, air traffic controllers, and reservation, ticket, and passenger agents.

AIR TRAFFIC CONTROLLERS

(D.O.T. 193.168)

Nature of the Work

Air traffic controllers are the guardians of the airways. They coordinate flights to prevent accidents and minimize delays in takeoffs and landings. Some regulate airport traffic; others regulate flights between airports.

Airport traffic controllers work in a tower near the runway to keep track of planes that are on the ground and in the air nearby. They radio pilots to give them permission to taxi, take off, or land. To assure safe conditions, they must consider many factors including weather, and the number, size, and speed of the planes in the area. They also must keep track of positions of planes both on the ground and in the air to control several aircraft simultaneously.

After a plane takes off, airport traffic controllers notify enroute controllers to take charge. Route controllers communicate with pilots by radio and use radar and other electronic equipment to help keep planes on course. They also warn pilots about nearby planes and other possible hazards. Each enroute controller is assigned a certain amount of airspace. One, for example, might be responsible for all planes that are 30 to 100 miles north of the airport and flying between 6,000 and 18,000 feet. As the flight progresses, the controller responsible for the aircraft notifies the controller who next will be responsible. Through this coordination, one enroute controller after another takes charge until the plane has safely arrived at its destination and airport traffic controllers are again in charge.

Places of Employment

About 22,000 persons worked as air traffic controllers for the Federal Aviation Administration (FAA) in 1974. Almost all worked at major airports and air route traffic control centers located near large cities. A few were assigned to control towers and centers outside the United States.

Training, Other Qualifications, and Advancement

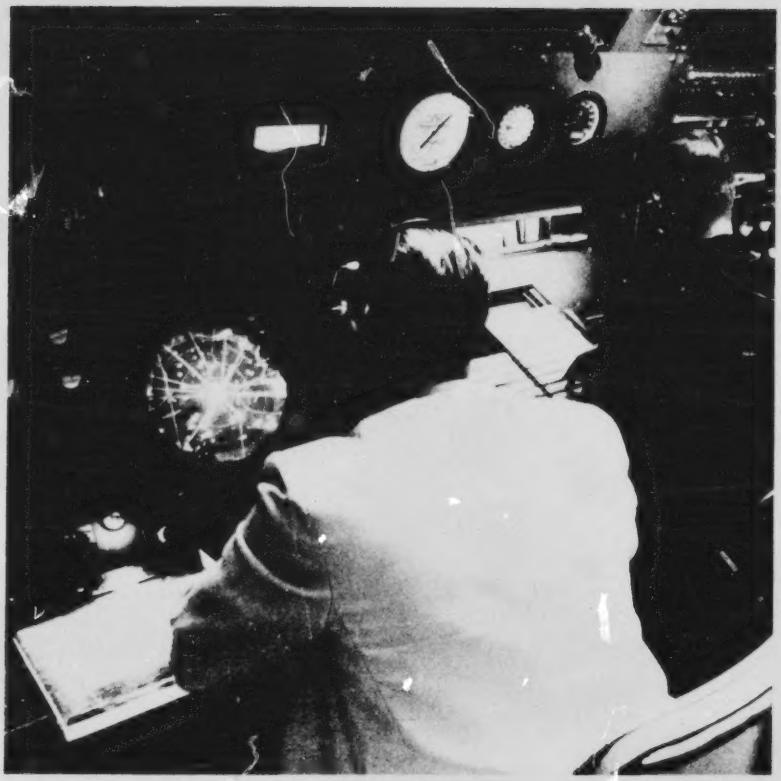
Air traffic controller trainees are selected through the competitive Federal Civil Service System. Applicants must be less than 31 years old and must pass a written test that measures their ability to learn and perform the controller's duties. In addition, applicants must have 3 years of progressively responsible work experience that demonstrates potential for learning and performing air traffic control work, or 4 years of college, or a combination of both. Applicants must be in excellent health, have vision correctable to 20/20, and must be able to speak clearly and precisely.

Successful applicants receive a combination of on-the-job and formal training to learn the fundamentals of the airway system, Federal aviation regulations, controller equipment, and aircraft performance characteristics. All receive intensive training in simulators at the FAA Academy in Oklahoma City. It usually takes 2 to 3 years to become a fully qualified controller. Each year, controllers must pass a physical examination each year; they must pass a job performance examination twice each year.

Controllers can transfer to jobs at different locations and advance to the job of chief controller. Some advance to more responsible management jobs in air traffic control and a few to top administrative jobs in the FAA.

Employment Outlook

Employment of air traffic controllers is expected to increase at about the same rate as the average for all occupations through the mid-1980's. In addition to openings resulting from growth, many others



Air traffic controllers use radar to follow planes in flight.

will arise as experienced controllers retire, die, or transfer to other jobs. Competition for jobs should be keen because the number of qualified applicants is expected to be much greater than the number of openings.

As the number of aircraft increases, the skyways will become more congested. To prevent collisions, the FAA has created spaces, near certain airports and above certain altitudes which require all pilots to receive directions from air traffic controllers. If, as expected, the number and size of these spaces are expanded, more controllers will be needed despite the greater use of new, automated control equipment.

College graduates who have civilian or military experience as controllers, pilots, or navigators, will have the best employment opportunities.

Earnings and Working Conditions

In 1974 controller trainees earned $7,700 or $9,500 a year; the average earnings for all controllers was $21,800 a year, or over twice the average for all nonsupervisory workers in private industry, except farming. Depending on length of service, they receive 13 to 26 days of paid vacation and 13 days of paid sick leave each year, life insurance, health benefits, and a more liberal retirement program than other Federal employees.

Controllers work a basic 40-hour week; however, they may work additional hours for which they receive overtime pay or equal time off. Because control towers and centers must be operated 24 hours a day, 7 days a week, controllers are assigned to night shifts on a rotating basis.

Air traffic controllers work under great stress. They must keep track of several planes at the same time and make certain all pilots receive correct instructions.

Many controllers belong to the Professional Air Traffic Controllers Organization.

Sources of Additional Information

A pamphlet providing general information about controllers and instructions for submitting applications is available from any U.S. Civil Service Commission Job Information Center. Look under U.S. Government, Civil Service Commission, in your telephone book to obtain a local Job Information Center telephone number and call for a copy of Announcement 418. If there is no listing in your telephone book, dial the toll-free number 800-555-1212 and request the toll-free number of the U.S. Civil Service Commission Job Information Center for your location.

AIRPLANE MECHANICS

(D.O.T. 621.281)

Nature of the Work

Today most travelers hardly think twice about flying thousands of feet above the ground. The confidence travelers have in airplanes is a tribute to the mechanics who maintain them. Airplane mechanics perform preventive maintenance, make repairs, and complete inspections required by the Federal Aviation Administration (FAA).

In order to keep planes in top operating condition, many mechanics specialize in preventive maintenance. Using a schedule which is based on the number of flight hours, calendar days, or a combination of these factors, the planes are inspected and necessary

maintenance is performed. Mechanics may take engines apart, measure the parts for wear with delicate instruments, check for invisible cracks with X-ray and magnetic inspection equipment, and replace parts as needed. They also may repair sheet-metal surfaces, measure the strength of control cables, or check for rust and cracks in parts of fuselages and wings. After completing inspections or making repairs, mechanics test the equipment to make sure the repairs were made properly.

Some mechanics specialize in repairing broken equipment. After obtaining a description of the problem from the pilot, mechanics locate and correct the faulty equipment. For example, a pilot may be ready to take a trip, but when checking the airplane before takeoff, may learn that the gas gauge does not work. After being told about the problem, mechanics may check the electrical connections, replace the gauge, or use electrical test equipment to make sure no wires are broken. They work as fast as safety permits so that the plane can be put back into service quickly.

Mechanics may work on one type of plane or may specialize in working on one part of the plane, such as engines or electrical systems. At small airports, mechanics usually make all kinds of inspections and repairs.

Places of Employment

About 100,000 airplane mechanics were employed in 1974, not including about 30,000 employed in aircraft manufacturing firms to assemble airplanes. Over one-half worked for airlines and about one-third worked for the Federal Government. The rest were general aviation mechanics, most of whom worked for small repair shops and companies that operate their own planes to transport executives.

Most airline mechanics work near large cities at the airlines' main bases. Employees of the Federal Government work at large military bases, while mechanics for small repair shops work at airports in every part of the country.

Training, Other Qualifications, and Advancement

Mechanics who work on civilian aircraft usually must be licensed by the FAA as "airframe mechanics," "powerplant mechanics," or "aircraft inspectors." Airframe mechanics are qualified to work on the fuselage, wings, landing gear, and other structural parts of the plane, while powerplant mechanics are qualified only for work on the engine. Combination airframe-and-powerplant mechanics can work on any part of the plane, and those with an inspector's license can certify work completed by other mechanics.

At least 18 months of work experience are required for an FAA airframe or powerplant license and, for a combined license, at least 30 months of experience working with both engines and airframes are required. To obtain an inspector's license, a mechanic must have held an airframe-and-powerplant license for at least 3 years. Applicants for all licenses also must pass written and oral tests and give practical demonstrations of their ability to do the work authorized by the license.

Most mechanics learn their job in the Armed Forces or in private trade schools certified by the FAA. Courses in these trade schools last about 2 years and provide training

As the number of airplanes increases, more qualified mechanics must be trained.

with the tools and equipment mechanics will use on the job; attendance at such schools may be used as a substitute for work experience when applying for an FAA license. However, these schools do not guarantee students jobs or FAA licenses.

A few mechanics gain experience through formal apprenticeship programs or on-the-job training. Some larger airlines train apprentices in carefully planned 3- or 4-year programs which include both classroom instruction and work experience. People who were aircraft mechanics in the Armed Forces usually have earned credit towards the requirements of apprenticeship. Small shops usually do not have apprenticeship programs, and new employees learn their skills by working with and observing experienced mechanics. For apprentice or trainee jobs, employers prefer high school graduates who are in good physical condition. Courses in mathematics, physics, and chemistry and experience in automotive repair or other mechanical work are helpful.

Aircraft mechanics must be able to do detailed work and have the strength to lift heavy parts and tools. Agility is important for the reaching and climbing that are necessary to the job. Aircraft mechanics must be willing to work in high places, such as on the top of wings and fuselages on large jet planes.

As aircraft mechanics gain experience, they can advance to more responsible jobs. Opportunities are best for those who have an airframe-and-powerplant license, as well as an aircraft inspector's license. The avenue of advancement is usually mechanic to head mechanic (or crew chief), to inspector, to head inspector, to shop supervisor. In airline companies, a few may advance to executive positions. With additional business training, some may open their own repair shops.

Employment Outlook

The number of aircraft mechanics is expected to increase about as fast as the average for all occupations through the mid-1980's. In addition to jobs resulting from growth, many job openings will result from the need to replace mechanics who transfer to other fields of work, retire, or die. However, job opportunities in general aviation, airline companies, the Federal Government will differ.

Job opportunities in general aviation are expected to be good. The number of aircraft used by companies for executive transportation is expected to grow rapidly, thus increasing the demand for mechanics. Since wages in small companies are frequently low, additional jobs will become available as experienced mechanics leave for better paying jobs with airlines or large private companies. Although employers in general aviation prefer applicants with an airframe-and-powerplant license from the FAA, some trainee jobs are available.

In contrast with general aviation, competition for airline jobs will be keen because the high wages attract more qualified applicants than there are jobs available.

A growing population and rising incomes are expected to increase the demand for airline transportation and, as airlines add more planes to meet this demand, more mechanics will be needed. However, because airlines are expected to meet the increased demand by replacing many of their smaller planes with jumbo jets, no significant increase in the number of planes, and thus in the employment of mechanics is expected until the late 1970's.

Little change in the number of mechanics employed by the Federal Government is expected. However, opportunities will fluctuate with changes in defense spending.

Earnings and Workings Conditions

In 1974, airline mechanics earned from $5.52 to $8.74 an hour. Annual earnings averaged $16,602, about twice the average for all nonsupervisory workers in private industry, except farming. As an additional benefit, airline mechanics and their immediate families receive reduced fare transportation with their own and most other airlines.

Mechanics usually work in hangars or in other indoor areas. However, when repairs must be made quickly, they may work outdoors. Mechanics sometimes must stand or lie in awkward positions when making repairs. Work areas are noisy when engines are being tested.

Mechanics employed by most major airlines are covered by union agreements. The principal unions in this field are the International Association of Machinists and Aerospace Workers and the Transport Workers Union of America. Some mechanics are represented by the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America.

Sources of Additional Information

For general information about airplane mechanics, write to the Aviation Maintenance Foundation, P.O. Box 739, Basin, Wyo. 82410.

Information about jobs in a particular airline may be obtained by writing to the personnel manager of the company. For addresses of airline companies, write to the Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

For information on jobs in a particular area, contact employers at local airports or local offices of the State employment service.

AIRPLANE PILOTS

(D.O.T. 196.168, .228, .268, and .283)

Nature of the Work

Pilots are skilled, highly trained professionals who have been carefully selected for their ability to fly safely. They transport passengers and cargo, and perform other tasks such as crop dusting and inspecting power lines. The pilot in command (called captain by the airlines) is in charge of the plane and supervises any other crew members. On larger planes, a copilot assists the pilot in air-to-ground communications, in monitoring flight and engine instruments, and in operating the plane's controls. Most large airliners have a third pilot serving as flight engineer. The flight engineer makes sure the many mechanical and electrical devices aboard the plane work properly.

Pilots must do a great deal of planning before a flight. They confer with a weather forecaster and choose a route, speed, and altitude that will give a safe, smooth flight. The pilot in command then coordinates the route with air traffic control personnel.

Before takeoff, pilots check the engines, controls, instruments, and other components to make sure everything is working properly. If any faulty equipment is located, a mechanic is called to make the repairs. During the flight, they radio to ground control stations to report their plane's altitude, air speed, weather conditions, or other flight details. Pilots steer the plane to each point on the flight plan and change altitude and speed as necessary. In addition, pilots frequently look at instruments to check the amount of fuel and condition of the engines.

If visibility during the flight is poor, pilots must rely completely on instruments. For example, they use the altimeter to fly safely above any mountains or other obstacles. A special navigation radio gives pilots information which, with the help of special maps, tells them exactly where the plane is. During landings in bad weather, airline pilots may use sophisticated landing equipment which provides directions to a point just above the runway. After landing and parking the plane, they go to the airline office and complete flight records required by the company or the Federal Aviation Administration (FAA).

Some specially trained airline pilots are "evaluators" or "check pilots." They fly with each captain at least twice a year to make sure FAA and company regulations are obeyed. Other pilots are instructors and spend much of their time giving flying lessons.

Although pilots employed by businesses usually fly smaller planes than airline pilots, their duties are much alike. These pilots, however, may perform minor maintenance and repair work on their planes.

Before take-off pilots make sure all equipment is working properly.

Places of Employment

About 79,000 civilian pilots worked full-time in 1974. About one-half worked for airline companies; most of the remainder trained student pilots or worked for large corporations that use their own airplanes to transport company executives. Others performed a variety of services for many different employers throughout the country such as flying air taxis or crop dusting planes, inspecting pipelines, or conducting sightseeing trips. Federal, State, and local governments also employed pilots.

Most pilots work at major airports close to cities. Over one-third of all pilots work near Los Angeles, San Francisco, New York, Dallas-

Fort Worth, Chicago, Miami, and Atlanta.

Training, Other Qualifications, and Advancement

All pilots who are paid to transport passengers or cargo must have at least a commercial airplane pilot's license from the FAA. To qualify for a commercial pilot's license, applicants must be at least 18 years old and have at least 250 hours of flight experience. They also must pass a strict physical examination to make sure they have 20/20 vision with or without glasses, good hearing, and no physical handicaps that prevent quick reactions. Applicants then must pass a written test covering subjects such as the principles of safe flight, navigation techniques, and FAA regulations. As the final step in getting a commercial license, applicants must demonstrate their flying ability to examiners.

In addition to a commercial license, pilots who fly in bad weather must be licensed by the FAA to fly by instruments. Pilots may qualify for this license after practicing flying by instruments for as least 40 hours, passing a written examination on instrument flying procedures and FAA regulations, and demonstrating their ability to fly by instruments to an examiner.

Licensing requirements for airline captains are different from those for other pilots. Captains must have an airline transport pilot's license as well as an instrument license from the FAA. Applicants must be at least 23 years old and have a minimum of 1,500 hours of flying experience during the previous 8 years, including night and instrument flying.

All licenses remain in effect as long as the pilot can pass the required physical examinations and the periodic tests of flying skills required by government regulations. The airline transport license, however, is not issued to pilots when they reach age 60.

Flying can be learned in military or civilian flying schools. Either kind of training satisfies the flight experience requirements for licensing, but those trained in the armed services may have the added opportunity to gain experience on large aircraft similar to airliners.

Pilots hired by airlines must be high school graduates; however, most airlines require 2 years of college and prefer to hire college graduates. Airline companies use psychological tests to determine an applicant's ability to make quick decisions and accurate judgments under pressure.

New airline pilots usually start as flight engineers. In the past, flight engineers were not required to be pilots. However, since the introduction of jet aircraft, union contracts require all new engineers to be qualified pilots.

Pilots working as flight engineers must obtain a flight engineer's license from the FAA. After several weeks of instruction in simulators and classrooms, they must pass FAA written and flight examinations to qualify for the license. Although airlines favor applicants who already have a flight engineer's license and a commercial pilot's license, they may train those who have only the commercial license.

Companies other than airlines generally require less total flying experience than airlines. However, a commercial pilot's license is usually required and companies prefer applicants with experience in the type of plane they will be flying. New employees generally start as copilots if the planes are less complex than airliners and do not require flight engineers.

Advancement for all new pilots is generally limited to other flying jobs. In the airlines, advancement opportunities usually depend on seniority provisions established by union contracts. After 5 to 10 years, flight engineers advance on the basis of seniority, to co-pilot and, after 10 to 20 years, to captain. In other than airline jobs, copilots may advance to pilot and, in large companies, to chief pilot who is in charge of aircraft scheduling, maintenance, and flight procedures.

Employment Outlook

Employment of pilots is expected to increase faster than the average for all occupations through the mid-1980's. In addition to the jobs from employment growth, openings will result as experienced pilots retire, die, or change occupations. However, competition for job openings should be keen because the number of qualified pilots seeking jobs is expected to exceed the number of openings.

More than half the jobs will occur outside the airlines. Companies are expected to increase the number of planes they operate and the number of pilots they employ to transport executives and cargo to places without scheduled airline service. Additional jobs will result from the need for more flight instructors to train new pilots and to insure that qualified pilots meet FAA proficiency standards.

The expected growth in airline passenger and cargo traffic will create a need for more airliners and more pilots to fly them. However, for the next few years airlines will be able to transport more people by buying bigger planes rather than more planes. Because the number of planes is not expected to increase immediately, opportunities should be limited until the late 1970's when airlines begin increasing the number of planes in operation.

Recent college graduates who have experience flying large, multiengine aircraft and who possess a commercial pilot's license and a flight engineer's license can expect first consideration for jobs with the major airlines. Other companies generally have fewer formal education and experience requirements than airlines. However, these com-

panies prefer applicants with flying experience in the type of plane they will be flying on the job.

Earnings and Working Conditions

Earnings of pilots and copilots are among the highest in the Nation. In 1974, the average salary for all airline pilots was $38,200 a year. Starting salaries for flight engineers ranged from $8,000 to $10,000 a year, while some senior captains on the largest aircraft earned more than $70,000. Based on limited information, earnings of pilots in other than airline companies ranged from $10,000 for copilots on small planes to $40,000 for chief pilots of companies with large jets.

Earnings depend on factors such as the type, size, and speed of the planes, and the number of hours and miles flown. Extra pay is given for night and international flights. As an additional benefit, pilots and their immediate families usually are entitled to a limited amount of reduced fare transportation on their own and other airlines.

Airlines operate flights at all hours of the day and night, so work schedules are often irregular. Under FAA rules airline pilots cannot fly more than 85 hours a month. Most actually fly only about 70 hours a month, and, as a result, they have many work-free days. However, airline pilots may be away from their home bases about one-third of the time or more. When they are away from home, the company provides hotel accommodations and an allowance for expenses.

Although pilots employed outside the airlines are prohibited by FAA regulations from flying more than 100 hours a month, their schedules are irregular and some fly 30 hours while others may fly 90 hours per month. These pilots frequently are responsible for maintaining records or scheduling flights, and do not have as much free time as airline pilots. They also may work irregular hours. Instructors for example, may give lessons on weekends or at night. However, with the exception of pilots who transport executives, most do not remain away from home overnight.

Although flying does not involve much physical effort, the pilot often is subject to mental stress and must be constantly alert and prepared to make decisions quickly.

Most airline pilots are members of the Air Line Pilots Association, International. Those employed by one major airline are members of the Allied Pilots Association.

Sources of Additional Information

Information about job opportunities in a particular airline and the qualifications required may be obtained by writing to the personnel manager of the company. Addresses of companies are available in the booklet *The People of the Airlines*. For a copy, write to:

Public Relations Department, Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

For information about the duties, as well as the physical and educational requirements for airline pilots contact:

Air Line Pilots Association, International, 1625 Massachusetts Ave. NW., Washington, D.C. 20036.

For information about job opportunities in companies other than airlines, consult the classified section of aviation trade magazines and apply to companies which operate aircraft at local airports.

To obtain information about jobs with the Federal Aviation Administration, telephone the Federal Job Information Center listed in your local phone book under United States Government, Civil Service Commission. If no center is listed, dial the toll-free number 800-555-1212 and request the toll-free number of the center that serves your area.

FLIGHT ATTENDANTS

(D.O.T. 352.878)

Nature of the Work

Flight attendants (also called stewardesses and stewards) are aboard almost all commercial passenger planes to help make the passengers' flight safe, comfortable, and enjoyable. Like other members of the flight crew they are responsible to the captain.

Before each flight, attendants see that the passenger cabin is in order, that supplies and emergency equipment are aboard, and that food and beverages are in the galley. As passengers come aboard, attendants greet them, check their tickets, and assist them by hanging up coats and stowing small pieces of luggage.

Before the plane takes off, attendants use the public address system to instruct passengers in the use of emergency equipment and check to see that all passengers have their seat belts fastened. In the air, they answer questions about the flight, distribute magazines and pillows, and help care for small children, elderly, and handicapped persons. On many flights, they serve cocktails and precooked meals.

Flight attendants preparing in-flight meals for passengers.

Places of Employment

About 41,000 flight attendants worked for the airlines in 1974. Though the vast majority are women, the proportion of men is increasing. Most attendants are stationed in major cities at the airlines' main bases; nearly three-fifths work near Chicago, Dallas, Los Angeles, Miami, New York, and San Francisco. Airliners generally carry 1 to 10 flight attendants, depending on the size of the plane and the proportion of economy to first-class passengers. Large aircraft like the Boeing 747 may have as many as 16 flight attendants.

Training, Other Qualifications, and Advancement

The airlines place great stress on the hiring of poised, tactful, and resourceful people. As a rule, applicants must be at least 19 years old and from 5 feet 2 inches to 6 feet tall, with weight in proportion to height. They must be in excellent health and have good vision; they also must speak clearly.

Applicants must be high school graduates. Those having 2 years of college, nurses' training, or experience in dealing with the public are preferred. Flight attendants for international airlines generally must be able to speak an appropriate foreign language fluently.

Most large airlines give newly hired flight attendants about 5 weeks of training in their own schools. Transportation to the training centers and an allowance while in training may be provided. Training includes classes in flight regulations and duties, company operations and policies, emergency procedures and first aid. Additional courses in passport and customs regulations are given trainees for the international routes. Towards the end of their training, students go on practice flights. The few airlines that do not operate schools generally send new employees to the school of another airline.

Some attendants are graduates of private schools that train people for airline jobs. Before enrolling in a private school, prospective students should check with the airline of their choice to make sure the school's training is acceptable.

After completing their training, flight attendants report for work at one of their airline's main bases. New flight attendants usually fill in on extra flights or replace attendants who are sick or on vacation. Because assignments are based on seniority, experienced attendants usually get their choice of flights.

Opportunities for advancement are limited. However, some attendants may advance to customer service director, instructor, or recruiting representative.

Employment Outlook

Employment of flight attendants is expected to grow faster than the average for all occupations through the mid-1980's. In addition to growth, openings will occur because of the need to replace experienced attendants who retire, die, or transfer to other occupations. However, job opportunities may vary because air travel is sensitive to ups and downs in the economy. Applicants can expect keen competition for any available jobs because the number of applicants is expected to exceed the number of openings. Applicants with 2 years of college and work or other experience in dealing with the public have the best chance of being hired.

Increases in population and income are expected to increase the number of airline passengers. To deal with this growth, airlines usually enlarge their capacity by increasing the number and size of planes in operation. Since the FAA safety rules require one attendant for every 50 seats, more flight attendants will be needed.

Earnings and Working Conditions

An examination of union contracts covering several large domestic and international airlines indicates that monthly earnings of beginning flight attendants ranged from $655 to $749 in 1974; the average for all was $869. As an additional benefit, flight attendants and their immediate families are entitled to a limited amount of reduced fare transportation on their own and most other airlines.

Since airlines operate around the clock 365 days a year, attendants may work at night, on holidays, and on weekends. They usually fly no more than 80 hours a month but they may devote up to 35 hours a month to ground duties. As a result of variations in scheduling and limitations on flying time, some attendants may have 15 days or more off each month. Of course, some time off may occur between flights while away from home. Attendants may be away from their home bases about one-third of the time or more. When they are away from home, the airlines provide hotel accommodations and an allowance for expenses.

Flight attendants have the opportunity to meet interesting people and see new places. However, the work can be strenuous and trying. Attendants stand during much of the flight and must remain pleasant and efficient regardless of how tired they may be.

Most flight attendants are members of either the Transport Workers Union of America or the Association of Flight Attendants.

Sources of Additional Information

Information about job opportunities in a particular airline and the qualifications required may be obtained by writing to the personnel manager of the company. Addresses of companies are available from:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

RESERVATION, TICKET, AND PASSENGER AGENTS

(D.O.T. 912.368 and 919.368)

Nature of the Work

In any company, the attitude and service of employees who deal with the public often make the difference between satisified or dissatified customers. In airline companies, this important personal contact with the public is provided by reservation, ticket, and passenger agents. These employees reserve seats, sell tickets, and help passengers board the planes.

Reservation agents give customers information on flight schedules and fares over the telephone. After finding out where the customers want to go, when, and from which airport they want to leave, agents check to find out if seats on a plane are available. Computers are used to keep track of flight space information so that agents at all reservation offices can quickly find out if a plane has seats available.

Ticket agents work in downtown offices or at airports. In addition to answering questions about schedules and making reservations, these agents fill out the ticket forms with information such as the flight number, passenger's name, and destination. At airports and at a few downtown offices they also tag passengers' luggage for shipment on the plane.

Passenger agents work only at airports and spend much of their time helping ticket agents give information, prepare tickets, and check baggage. However, they have the added responsibility of helping passengers board the plane. These agents may use the public address system to tell passengers when and where to get on the plane. Before permitting passengers to get on planes, agents collect tickets and assign seats. Passenger agents also keep records of passengers on each plane and assist customers with problems such as lost or damaged baggage.

Places of Employment

About 56,000 reservation, ticket, and passenger agents were employed in 1974. Most worked in downtown ticket and reservation offices and at airports in or near large cities where most airline passenger and cargo business originates. Some are employed in smaller communities served by airlines.

Agent uses computer terminal to make reservation.

Training, Other Qualifications, and Advancement

Because reservation, ticket, and passenger agents must deal directly with the public, airlines have strict hiring standards with respect to appearance, personality, and education. A good speaking voice is essential because these employees frequently use the telephone or public address systems. High school graduation generally is required, and some college training is preferred.

New employees begin as reservation, or ticket agents. They usually receive about a week of classroom instruction to learn how to get information from the book of flight schedules and from the computer. They also learn how to handle customers courteously. After completing the classroom instruction, new employees receive on-the-job training from experienced workers. About 3 weeks are needed before an employee is qualified to handle the job without close supervision.

Advancement opportunities are limited. Reservation, and ticket agents may become passenger agents; passenger agents may advance to supervisory positions. A few may eventually become city and district managers for airline ticket offices.

Employment Outlook

Employment of reservation, ticket, and passenger agents is expected to grow faster than the average for all occupations through the mid-1980's. In addition to jobs that result from growth, many openings will arise as experienced workers retire, die, or transfer to other jobs. Opportunities for employment may fluctuate from year to year, however, since the number of airline passengers varies with ups and downs in the economy. Applicants may find considerable competition for any openings because a large number of people are attracted to airline jobs.

More agents will be needed because of the anticipated increase in airline passengers. Although airlines are installing machines to process reservations, keep records, and perform other routine tasks, machines cannot replace the personal contact that is an important part of a reservation, ticket, or passenger agent's job.

Earnings and Working Conditions

Beginning salaries for reservation, ticket, and passenger agents were about $700 a month in 1974, based on the limited information available. The average for all agents was $920 a month, about one-third more than the average for all nonsupervisory workers in private industry, except farming. As an added benefit agents and their immediate families are entitled to a limited amount of reduced fare air transportation with their own and many other airlines.

Agents generally work 40 hours a week. However, airlines operate flights at all hours of the day and night and work schedules are irregular. Some agents work nights and weekends.

Many agents belong to labor unions. Four unions cover most of the organized agents: the Air Line Employees Association International; the Transport Workers Union of America; the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees; and the International Brotherhood of Teamsters, Chaffeurs, Warehousemen and Helpers of America (Ind.).

Sources of Additional Information

For a pamphlet describing the duties of reservation, ticket, and passenger agents, write to:

Air Line Employees Association, 5600 S. Central Ave., Chicago, Ill. 60638.

Information about jobs in a particular airline may be obtained by writing to the personnel manager of the company. Addresses of companies are available from:

Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

MERCHANT MARINE OCCUPATIONS

The American merchant marine is a vital link in the Nation's transportation system. It transports America's exports and, in turn, brings imports from the rest of the world. In time of military conflict, it carries troops, arms, and supplies to combat areas. Seafaring employment offers a variety of interesting and rewarding careers as well as travel and adventure.

About 27,500 officers and sailors worked aboard U.S. oceangoing vessels in late 1974. The work aboard ships is divided among the deck, engine, and steward departments. The deck department is responsible for navigation, maintenance of the hull and deck equipment, and the supervision of loading, unloading, and storing of cargo. Personnel in the engine department operate and maintain the machinery that propels the vessel. The steward's department feeds the crew and maintains living and recreation areas.

Due to higher labor and shipbuilding costs the U.S. merchant fleet finds it difficult to compete in the world shipping market. To insure that our country has a fleet operating in regular or essential trade routes, the Government subsidizes many ships and in 1970 passed a law to subsidize the construction of 30 new ships annually over a 10 year period. The number of ships built, however, is expected to be only slightly more than the number of older ones taken out of service. Therefore, the size of the U.S. merchant fleet probably will not grow significantly.

Little or no change in the employment of officers is expected through the mid-1980's. Employment of sailors, on the other hand, is expected to decline because new ships are equipped with laborsaving innovations such as automated enginerooms.

MERCHANT MARINE OFFICERS

Nature of the Work

In command of every oceangoing vessel is the *captain* (D.O.T. 197.168) or *master* who is the shipowner's sole representative. The captain has complete authority and responsibility for the ship's operation, including discipline and order, and the safety of the crew, passengers, cargo, and vessel.

While in port, the captain may serve as the shipowner's agent in conferring with custom officials, and in some cases, act as paymaster for the ship. Although not technically members of a specific department, captains generally are associated with the deck department, from whose ranks they have been promoted.

Deck Department. Deck officers or "mates," as they are traditionally called, direct the navigation of the ship and the maintenance of the deck and hull. They maintain the authorized speed and course; plot the vessel's position at frequent intervals; post lookouts; record information in the "log" of the voyage; and immediately notify the captain of any unusual occurrences. Deck officers must be familiar with modern navigational devices, such as sonar and radio directional finders, to operate ships safely and efficiently.

The *chief mate* (D.O.T. 197.133), also known as the first mate or chief officer, is the captain's key assistant in assigning duties to the deck crew and maintaining order and discipline. The chief mate also plans and supervises the loading and unloading of cargo, and assists the captain in taking the ship in and out of port. On some ships, the chief mate also may be in charge of first-aid treatment.

By tradition, the *second mate* (D.O.T. 197.133) is the navigation officer. The second mate sees that the ship is provided with the necessary navigation charts and that navigating equipment is maintained properly.

Third mates (D.O.T. 197.133), the most junior-rated deck officers, are responsible for the care and the maintenance of the navigating bridge and the chartroom. They act as the signal officer and are in charge of all signaling equipment. They also assist in the supervision of cargo loading and unloading. The third mate frequently inspects lifesaving equipment to be sure it is ready for use in fire, shipwreck, or other emergencies.

Engine Department. Marine engineers operate and maintain all engines and machinery aboard ship. The *chief engineer* (D.O.T. 197.130) supervises the engine department, and is responsible for the efficient operation of engines and other mechanical equipment. The chief engineer oversees the operation of the main powerplant and auxiliary equipment while the vessel is underway and keeps records of equipment performance and fuel consumption.

The *first assistant engineer* (D.O.T. 197.130) supervises engineroom personnel and directs operations such as starting, stopping, and controlling the speed of the main engines. The first assistant engineer also oversees and inspects the lubrication of engines, pumps, generators, and other

Captain plots vessel's course.

machinery and, with the aid of the chief engineer, directs all types of repairs.

The *second assistant engineer* (D.O.T. 197.130) has charge of the boiler and associated equipment such as the water-feed system and pumps. The second assistant engineer also makes sure proper steam pressure and oil and water temperatures are maintained and supervises the cleaning of boilers.

The *third assistant engineer* (D.O.T. 197.130) supervises the operation and maintenance of the lubrication system and a variety of other engineroom equipment. Some third assistant engineers are responsible for the electrical and refrigeration systems aboard ships.

Other officers. A ship keeps contact with the shore and other vessels through its *radio officer* (D.O.T. 193.282), who also maintains radio equipment. A passenger ship carries three to six radio officers; the average cargo vessel employs one. These officers send and receive messages by voice or Morse code. They periodically receive and record time signals, weather reports, position reports, and other information. Radio officers also may maintain depth recording equipment and electronic navigation equipment.

Some freighters and all passenger vessels carry *pursers* (D.O.T. 197.168). The purser or staff officer does the extensive paperwork that is required before a ship enters or leaves a port. They prepare payrolls and assist passengers as required. In recent years, the Staff Officers Association has established a program to train pursers to act also as pharmacists' mates. This instruction is designed to improve the medical care aboard freighters and tankers and facilitate U.S. Public Health Service clearance when a ship arrives in port. All passenger ships must carry licensed doctors and nurses.

Places of Employment

Nearly 7,500 officers were employed aboard U.S. oceangoing vessels in late 1974. Deck officers and engineering officers accounted for more than four-fifths of the total, and radio officers made up most of the remainder.

About one-thirds of the officers were aboard freighters and most of the remainder were aboard tankers. Only a small percentage were on passenger vessels.

Training, Other Qualifications, and Advancement

Applicants for an officer's license in the deck or engineering departments of oceangoing vessels must meet certain legal requirements. Captains, chief and second mates, and chief and first assistant engineers must be at least 21 years old. The minimum age for third mates, third assistant engineers, and radio operators is 19. In addition, applicants must present proof of U.S. citizenship and obtain a U.S. Public Health Service certificate attesting to their vision, color perception, and general physical condition.

Besides legal and medical requirements, candidates must also have at least 3 years of appropriate sea experience or be a graduate of an approved training program. Deck officer candidates must pass Coast Guard examinations that require extensive knowledge of navigation, cargo handling, and deck department operations. Marine engineering officer candidates must demonstrate in-depth knowledge of propulsion systems, electricity, plumbing and steam

fitting, metal shaping and assembly, and ship structure. To advance to higher ratings, officers must pass progressively more difficult examinations.

For a Coast Guard license as a radio officer, applicants must have a first or second-class radiotelegraph operator's license issued by the Federal Communications Commission. For a license to serve as the sole radio operator aboard a cargo vessel, the Coast Guard also requires 6 months of radio experience at sea.

Unlike most professions, no education requirements have been established for officers. A sailor with 3 years' experience in the deck or engine department may apply for either a third mate's license or for a third assistant engineer's license. However, because of the complex machinery, and navigational and electronic equipment on modern ships, formal training usually is needed to pass the Coast Guard's examination for these licenses.

The fastest and surest way to become a well-trained officer is through an established training program. Such programs are available at the U.S. Merchant Marine Academy at Kings Point, N.Y., and at five State merchant marine academies: California Maritime Academy, Vallejo, Calif.; Maine Maritime Academy, Castine, Maine; Massachusetts Maritime Academy, Hyannis, Mass.; Texas Maritime Academy, Galveston, Tex.; and New York Maritime College, Fort Schuyler, New York, N.Y. About 550 students graduate each year from these schools; about one-half are trained as deck officers and one-half as marine engineers. Admission to the Federal academy is through nomination by a member of Congress, whereas entrance to the other academies is made through written application directly to the school.

Most of the academies offer 4-year programs in nautical science or marine engineering, which include courses such as navigation, mathematics, electronics, propulsion systems, electrical engineering, languages, history, and shipping management, as well as practical experience at sea. After Coast Guard examinations are passed, licenses are issued for either third mate or third assistant engineer. In addition, graduates may receive commissions as ensigns in the U.S. Naval Reserve.

Because of their thorough grounding in theory and its practical application, academy graduates are in the best position to move up to master and chief engineer ratings. Their well-rounded education also helps qualify them for shoreside jobs such as marine superintendent, operating manager, or shipping executive.

Graduates of the U.S. Merchant Marine Academy have an obligation to serve a minimum of 3 years as officers in the merchant marine or in a uniform, of the United States.

A number of trade unions in the maritime industry provide officer training. These unions include the International Organization of Masters, Mates and Pilots; the Seafarers' International Union of North America; the Brotherhood of Marine Officers; and the National Marine Engineers' Beneficial Association. Most union programs are designed to upgrade experienced sailors to officer ratings, although some programs accept inexperienced young persons. For example, the National Marine Engineers' Beneficial Association (MEBA) operates the Calhoon MEBA Engineering School in Baltimore, Md., which offers high school graduates a 3-year apprenticeship training program in preparation for a third assistant engineer's license. The program consists of both classroom instruction and sea experience and provides free room, board, medical care, and text books in addition to a monthly grant. Trainees must agree to serve at least 3 years in the U.S. Merchant Marine after the 3-year training period.

The U.S. Merchant Marine Academy now selects about 10 percent of the approximately 300 persons who enter the academy each year to be trained as "omnicompetent" officers. They are taught both navigational and technical skills so they can work in either the deck or engine department.

Advancement for deck and engine officers is along well-defined lines and depends primarily upon specified sea experience, passing a Coast Guard examination, and leadership ability. Deck officers start as third mates. After 1 year's service they are eligible to take a second mate examination. A second mate may apply for a captain's license after 1 year of service. Officers in the engine department start as third assistant engineers. After 1 year of service, they may apply for a second assistant's license and finally a chief engineer's license.

Employment Outlook

Little change in the employment of ships' officers is anticipated through the mid-1980's because the number of ships in our merchant fleet is not expected to increase significantly. (See introduction on merchant marine occupations.) Nevertheless, many job openings will arise due to the need to replace experienced officers who retire, die, or take shoreside employment. Replacement needs are relatively high because ships' officers are somewhat older, on the average, than workers in other occupations and the liberal pension plans offered by the merchant marine industry encourage early retirement.

Employment opportunities will be best for graduates of maritime academies, particularly the U.S. Merchant Marine Academy. Graduates who cannot find jobs on

merchant ships may find jobs in related fields. For example, trained officers are needed on oceanographic research vessels, on vessels that carry supplies to offshore oil drilling rigs, and on dredges operated by the Army Corps of Engineers.

Earnings and Working Conditions

Earnings of officers depend upon their rank and the type of ship. Wages are highest on large ships. The accompanying tabulation shows monthly base wages for officers aboard an average freighter in 1974. Additional payments for overtime or for assuming extra responsibilities generally average about 50 percent of base pay. For example, a second mate with a monthly base pay of $1,159 may regularly earn about $1,739 each month.

	Base pay [1]
Captain	$3,009
Chief engineer	2,734
First assistant engineer	1,635
First mate	1,635
Radio officer	1,225
Second assistant engineer	1,159
Second mate	1,159
Third assistant engineer	1,041
Third mate	1,041
Purser	872

[1] East Coast wages in September, 1974 aboard a 12,000–17,000 power ton single screw ship.

Officers and their dependents enjoy substantial pension and welfare benefits. Vacations range from 90 to 180 days a year. Officers with 20 years of service have the option of a monthly pension of $325 or 37 1/2 percent of their monthly rate of pay. Those who have 25 years of service are eligible for $425 a month or 50 percent of their monthly rate. Officers forced to retire prematurely due to a permanent disability receive partial pensions. Comprehensive medical care and hospitalization are provided for officers and their families through union programs.

The workweek aboard ship is considerably different from the workweek on shore. At sea, most officers are required to stand watch. Watchstanders work 7 days a week. Generally, they work two 4-hour watches (shifts) during every 24-hour period and have 8 hours off between each watch. Some officers are day workers. They work 8 hours a day, Monday through Friday. Both watchstanders and dayworkers are paid overtime for work over 40 hours a week. When the ship is in port, the basic workweek is 40 hours for all crewmembers.

The duties aboard ship are hazardous compared to other industries. At sea, there is always the possibility of injuries from falls or the danger of fire, collision, or sinking.

A number of labor organizations represent merchant marine officers. The two largest are the International Organization of Masters, Mates and Pilots, representing deck officers, and the National Marine Engineers' Beneficial Association, representing engineering officers. The Brotherhood of Marine Officers represents deck and engine officers on some ships. The Staff Officers Association and the Marine Staff Officers Association represents pursers aboard certain freighters. Radio officers are represented by the American Radio Association and the Radio Officers Union. In addition, a number of independent unions organize officers on tankers. Officers' unions may require initiation fees as high as $1,000.

Sources of Additional Information

For general information about merchant marine officer's jobs, write to:

Office of Maritime Manpower, Maritime Administration, U.S. Department of Commerce, Washington, D.C. 20235.

Information about job openings, qualifications for employment, wage scales, and other particulars is available from local maritime officers' unions. If no maritime union is listed in the local telephone directory, contact:

International Organization of Masters, Mates and Pilots, 39 Broadway, New York, N.Y. 10006.

National Marine Engineers' Beneficial Association, 17 Battery Pl., New York, N.Y. 10004.

MERCHANT MARINE SAILORS

Nature of the Work

Sailors make up most of a merchant ship's crew and do most of the manual labor. Employment is along craft lines with varying skill levels. Each worker is assigned to one of the following departments: deck, engine, or steward's.

Deck Department. *Ordinary seamen* (D.O.T. 911.887), the entry rating in the deck department, scrub decks, coil and splice ropes, paint, clean personnel quarters, and do other general maintenance work. They also may relieve able seamen who steer the ship and act as lookouts. Most freighters and tankers customarily employ three ordinary seamen. However, on many new automated ships, the job of ordinary seaman has been eliminated.

Able seamen (D.O.T. 911.884) make up about one-fifth of all sailors. They must have a thorough knowledge of all parts of the ship and be able to handle all gear and deck equipment. They act as quartermasters to steer the ship. Usually, they each take 2-hour turns at the wheel, and as lookouts report sightings to deck officers. Freighters and tankers usually carry six able seamen.

Able seamen also are responsible for rigging, repairing, and stowing cargo-handling and other gear.

They must be able to tie common knots and handle mooring lines when the ship is docking or departing. In addition to their more skilled tasks, they do general deck maintenance work similar to that done by ordinary seamen.

Because of the ever-present danger of fire at sea, able seamen must be familiar with fire prevention and control methods. They participate in periodic boat drills and are trained in all operations connected with launching lifeboats and liferafts.

The *boatswain* (D.O.T. 911.131), or bosun, is the highest ranking able seaman. As boss of the deck crew, the boatswain relays the deck officers' orders and sees that these orders are carried out. The boatswain assists the chief mate in assigning work to crewmembers and directs general maintenance operations such as cleaning decks and polishing metalwork. When the ship docks or anchors, the boatswain supervises the deck crew in handling the lines used for mooring.

Most cargo vessels carry one to three *deck utility hands* (D.O.T. 911.884), who maintain the deck department under the supervision of the boatswain. They determine the condition of bilges (compartments in the bottom of the hull) and do general maintenance work.

Some vessels carry a *ship's carpenter* (D.O.T. 860.281) who secures cargo hatches and ports, and braces (shores) cargo. The carpenter also may operate winches that hoist and drop the anchor and seal the hawsepipes (steel pipes through which anchor chains pass) when anchor and chains are not in use. Because of mechanization, newer ships are sailing with fewer carpenters and deck utility hands.

Engine Department. The engineering staff consists of a variety of occupational specialties requiring varying degrees of skill from the entry rating of wiper to specialized skilled jobs such as refrigerator engineer. *Wipers* (D.O.T. 699.887) keep the engineroom and machinery clean. Most cargo vessels carry two or three wipers. *Oilers* (D.O.T. 911.884) lubricate mechanical equipment. They make regular rounds of ship machinery to check oil pressures and flow. Oilers also may help overhaul and repair machinery. *Firers-watertenders* (D.O.T. 951.885) check and regulate the amount of water in the boilers, inspect gauges, and regulate fuel flow to keep steam pressure constant. They also check the operation of evaporators and condensers and test water for salt control; clean oil burning equipment; and clean strainers used to filter dirt from oil.

The ship's *electrician* (D.O.T. 825.281) repairs and maintains electrical equipment, such as generators and motors. Electricians also test wiring for short circuits and remove and replace fuses and defective lights. Some vessels have two electricians.

Certain types of ships require workers who have special skills, such as *refrigeration engineers* (D.O.T. 950.782) who maintain proper temperatures in refrigerator compartments for perishable cargoes such as meat and vegetables. Staffing requirements have been reduced significantly in the engineering department aboard automated ships. For example, conventional vessels generally carry a crew of twelve sailors in the engineering department, whereas new ships only carry four: three deck engine mechanics and one wiper. Deck engine mechanics replace oilers, firer-watertenders, and electricians on conventional vessels.

Steward's Department. The *chief steward* (D.O.T. 350.138) supervises the preparation and serving of

meals and the upkeep of living quarters aboard ship. The *chief cook* (D.O.T. 315.131) and assistant cooks prepare meals. The chief cook also supervises the other galley (ship's kitchen) workers and is responsible for keeping the galley clean and orderly. *Utility hands* (D.O.T. 318.887) and *mess attendants* (D.O.T. 350.878) complete the crew in the steward's department. These beginning jobs require little skill. Utility hands carry food supplies from the storeroom and iceboxes, prepare vegetables, wash cooking utensils, and scour galley equipment. Mess attendants set tables, serve meals, clean tables, wash dishes, and care for living quarters.

Due to the greater use of prepackaged foods and smaller crew sizes, many new ships have reduced the number of workers in the steward's department. For example, the chief cook and chief steward are replaced by a combination chief steward/cook.

Places of Employment

About 20,000 sailors were employed aboard U.S. oceangoing vessels in late 1974. Nearly two-thirds were aboard freighters, and most of the remainder were aboard tankers. Only a small percentage were on passenger ships.

Training, Other Qualifications, and Advancement

Although not required, previous sea experience in the Coast Guard or Navy is a good background for entering the merchant marine. Applicants must have health certificates. In addition, they must obtain a merchant mariner's document from the U.S. Coast Guard. The document, however, does not guarantee a job. It merely qualifies a person to be considered for a job when the supply of regular workers has been exhausted. To get a job, a person must be present at the hiring hall when the opening becomes available. In good shipping times, an opening may come within a week; in less prosperous times, it may take much longer.

Hiring halls are located in the chief ports of the country. They are operated by unions for commercial vessels and by the Navy's Military Sealift Command (MSC) for government-operated ships. In most ports along the Atlantic and Gulf Coasts and Great Lakes, the National Maritime Union and the Seafarers' International Union operate hiring halls. The Sailors' Union of the Pacific operates hiring halls in many ports of the West Coast. MSC employment offices are located at Brooklyn, N.Y.; New Orleans, La.; and Oakland, Calif.

Jobseekers are given shipping cards when they register at the hiring hall. The shipping companies send job orders to the hiring hall, and sailors who have been unemployed the longest get first preference on any jobs for which they are qualified. Applicants must be present at the hall when jobs are announced. Applicants may lose their places if they are not present or have turned down three job offers.

A sailor advances in the deck and engine departments by serving a designated period in a rating, and by successfully completing a Coast Guard examination that tests the ability to use and maintain equipment. For example, after serving a minimum of 1 year, an ordinary seaman may apply to the Coast Guard for limited endorsement as an able seaman. For full endorsement, applicants must be at least 19 years of age and pass an examination to test their knowledge of seamanship and ability to carry out all the duties required of able seamen. Able seamen who have supervisory ability may advance to boatswain after years of service.

Advancement to higher positions in the steward's department is by recommendation of the chief steward to the captain. A mess attendant or utility hand can advance to third cook, to cook-baker, to chief cook, and finally to chief steward.

Most training programs in the industry are designed to help experienced workers upgrade their ratings. However, the Seafarers' International Union of North America operates the Harry Lundeberg School for seamanship at Piney Point, Md. that accepts a limited number of young people who have no sea experience and trains them in general seamanship skills. Upgrading courses for sailors are offered by the Seafarers' Union, the National Maritime Union of America, and a number of other organizations.

Employment Outlook

Employment of merchant sailors is expected to decline through the mid-1980's. Some job openings, however, will arise each year due to the need to replace experienced sailors who retire, die, or quit the sea for other reasons. Competition for these positions is expected to be keen because the number of people seeking jobs as sailors probably will exceed the number of openings. Most openings will be filled by experienced sailors who are unemployed.

The number of ships in our merchant fleet is not expected to increase significantly in the years ahead. (See introduction on merchant marine occupations.) Older vessels will be replaced by larger ships equipped with features that reduce labor requirements. New ships, for example, have automated enginerooms which can be operated with smaller crews.

Earnings and Working Conditions

Crewmembers of American merchant ships enjoy excellent pay and fringe benefits. Earnings depend on job assignments and type of vessel. Basic monthly pay for a cross section of ratings on a typical

freighter in 1974 is shown in the accompanying tabulation:

	Base pay [1]
Electrician	$946
Chief steward	804
Carpenter	739
Cook/Baker	696
Deck utility hand	683
Able seaman	612
Firer-watertender	612
Oiler	612
Wiper	568
Ordinary seaman	478
Mess attendant/utility hand	474

[1] East Coast wages in September, 1974 aboard a 12,000–17,000 power ton single screw ship.

Monthly wages are supplemented by premium pay for overtime and other factors. On the average, premium earnings are equal to about 50 percent of base wages. For example, an oiler with a monthly base pay of $612 regularly earns about $918 each month.

Liberal employer-financed fringe benefits are provided. Vacations range from 90 to 180 days a year. Sailors may retire on pensions after 20 years of service. Sailors and their dependents are covered by comprehensive medical care and hospitalization programs.

The workweek aboard ship is considerably different from the workweek on shore. At sea, most sailors are required to stand watch. Watchstanders work 7 days a week. Generally, they work two 4-hour watches (shifts) during every 24-hour period and have 8 hours off between each watch. Some sailors are day workers. They work 8 hours a day, Monday through Friday. Both watchstanders and dayworkers are paid overtime for work over 40 hours a week. When the ship is in port, the basic workweek is 40 hours for all crewmembers.

The duties aboard ship are hazardous compared to other industries. At sea, there is always the possibility of injuries from falls or the danger of fire, collision, or sinking.

A person working in the engineroom must be able to withstand high temperatures. A deck worker must adapt to both bitter cold and the hot sun.

Accommodations for sailors aboard U.S. vessels are generally good, but not luxurious. Meals are served in a messroom, which often doubles as a recreation room where the crew can read, write letters, play cards, and socialize. Crewmembers generally share quarters aboard older ships and have little privacy, but most new ships have single berth rooms.

Sailors are represented by a number of labor organizations; the two largest are the National Maritime Union of America and the Seafarers' International Union of North America.

Sources of Additional Information

For general information about merchant marine sailors' jobs, write to:

Office of Maritime Manpower, Maritime Administration, U.S. Department of Commerce, Washington, D.C. 20235.

Information about job openings, qualifications for employment, wage scales, and other particulars is available from local maritime unions. If no maritime union is listed in the local telephone directory, contact:

National Maritime Union of America, 36 Seventh Ave., New York, N.Y. 10011.

Seafarers' International Union of North America, 675 Fourth Ave., Brooklyn, N.Y. 11232.

RAILROAD OCCUPATIONS

People, food, and industrial materials all move along the 200,000 miles of railroad lines that crisscross the Nation. In 1974, the railroads provided jobs for about 560,000 people. Railroad jobs are found in all States except Hawaii, and in communities of all sizes. Large numbers of railroad workers are employed at terminal points where the railroads maintain control offices, freight yards, and maintenance and repair shops. Chicago, the hub of the Nation's railroad system, has more railroad workers than any other area. Many workers also are employed in or near New York, Los Angeles, Philadelphia, Minneapolis, Pittsburgh, and Detroit.

Railroad workers can be divided into four main groups: Operating employees; station and office workers; equipment maintenance workers; and property maintenance workers.

Operating employees make up almost one-third of all railroad workers. This group includes locomotive engineers, conductors, and brake operators. Whether on the road or at terminals and railroad yards, they work together as traincrews. Some other employees in this group are hostlers, who prepare locomotives for the traincrews, and switchtenders, who throw track switches within railroad yards.

One-fourth of all railroad workers are *station and office employees*, who direct train movements and handle the railroads' business affairs. Professionals such as managers, accountants, statisticians, and systems analysts do administrative and planning work, while clerks handle business transactions, keep records, and prepare statistics. Agents manage the business affairs of the railroad station. Telegraphers and telephoners pass on instructions to traincrews and help agents with clerical work.

More than one-fifth of all railroad employees are *equipment maintenance workers*, who service and repair locomotives and cars. This group includes car repairers, machinists, electrical workers, sheet-metal workers, boilermakers, and blacksmiths.

Property maintenance workers, who make up about one-sixth of all railroad employees, build and repair tracks, tunnels, signal equipment, and other railroad property. Trackworkers repair tracks and roadbeds. Bridge and building workers construct and repair bridges, tunnels, and other structures along the right-of-way. Signal workers install and service the railroads' vast network of signals, including highway-crossing protection devices.

Discussions of the work, training, outlook, and earnings for most major occupations in railroads are presented in the statements that follow. Information on employment also is available in the statement on Occupations in the Railroad Industry elsewhere in the *Handbook*. Details about specific jobs may be obtained from local railroad offices. General information on the industry is available from:

Association of American Railroads, American Railroads Building, 1920 L St. NW., Washington, D.C. 20036.

BRAKE OPERATORS

(D.O.T. 910.364 and .884)

Nature of the Work

Brake operators work on passenger and freight trains and in railroad yards.

All passenger and most freight train crews include two road brake operators—one in the locomotive with the engineer and another in the caboose with the conductor. A few small freight trains need only one. Before departure, road brake operators inspect the train to make sure that all couplers and airhoses are fastened, that handbrakes on all the cars are released, and that the airbrakes are functioning correctly. While underway they regularly look for smoke, sparks, and other signs of sticking brakes, overheated axle bearings, and other faulty equipment. They may make minor repairs to airhoses and couplers. In case of unexpected stops, brake operators set out signals to protect both ends of the train.

Road brake operators throw switches to route freight trains onto industrial tracks, uncoupling cars that are to be delivered and coupling those that are to be moved out. On passenger trains, they regulate car lighting and temperature, and help the conductor collect tickets and assist passengers.

Yard brake operators (also known as yard couplers or helpers) help assemble and disassemble trains in railroad yards, according to instructions from yard conductors. They use lanterns, paddles, or two-way radios to signal engineers where to move cars. After uncoupling a recently delivered car, they throw track switches to route it to certain tracks if it is to be unloaded, or to an outgoing train if its final destination is further down the line. They may ride the car, operating the handbrake to regulate its speed.

Brake operator signals to engineer.

Training, Other Qualifications, and Advancement

Beginning brake operators make several trips with an experienced operator and conductor to become familiar with the job. Their names are then put on the "extra board" and they are given assignments to substitute for workers who are absent for vacations, illness, or other reasons. Usually they work a year or so before they learn the job thoroughly, and several more years before they gain enough seniority to get a regular assignment.

Employers prefer applicants who are high school graduates or the equivalent. Good eyesight and hearing are essential. Mechanical aptitude is helpful. Physical stamina is necessary to climb ladders, board moving trains, throw switches, and operate handbrakes. Most employers require that applicants pass physical examinations.

With sufficient seniority, brake operators may become conductors. These jobs are always filled by promoting experienced brake operators who have qualified by passing written and oral tests on signals, brake systems, timetables, operating rules, and other subjects. Some companies require that these tests be passed within the first few years of the brake operator's employment. Since promotions on almost all railroads are controlled by seniority rules, brake operators usually wait at least 10 years before becoming conductors. Advancement is limited by the number of conductor jobs, and there are many more brake operators than conductors. Some brake operators in freight service move to passenger service, usually considered more desirable because it is less strenuous.

Employment Outlook

Employment of brake operators—who numbered nearly 75,000 in 1974—is expected to decline through the mid-1980's. Some opportunities for new workers, however, will develop as experienced brake operators retire, die, advance to jobs as conductors, or transfer to other work.

Even though total employment of brake operators is expected to decrease, the number of those in road service will increase since more trains will be needed to haul the additional freight volume created by growth in population and industry. Employment gains will be moderated, however, by technological innovations which make it possible to move freight more rapidly. For example, central traffic control systems enable a dispatcher at a central location to control all signals and track switches over a vast section of track. Trains operating on track under this system spend less time at sidings waiting for others to pass. Changes in the size of train crews—eliminating one brake operator where there are now two—may further reduce employment growth.

The number of yard brake operators is expected to decrease, primarily due to the installation of automatic classification systems in more yards. In an automatic classification yard, cars are braked and routed by electronic controls. Fewer brake operators are needed in these yards, mainly to connect airhoses, uncouple cars, and retrieve misrouted ones. Yard employment also will be affected as railroads use larger, better designed freight cars which take as much time to route as older ones, but carry more freight.

Earnings and Working Conditions

In 1974, brake operators had average monthly earnings of $1,084 in yard service, $1,365 in freight service, and $1,390 in passenger service. These earnings were about twice as much as the average for all nonsupervisory workers in private industry, except farming.

Yard brake operators usually work a 40-hour week and receive premium pay for overtime. Road brake operators are under a dual system of pay and are paid according to miles traveled or hours worked, whichever is greater.

Brake operators often work nights, weekends, and holidays. Since freight and passenger brake operators often work on trains that operate between terminals that are hundreds of miles apart, they may spend several nights a week away from home. Brake operators assigned to extra board work have less steady work, more irregular hours, and lower earnings than those with regular assignments. They may be asked to report to work on short notice and at odd hours. Yard and freight service brake operators face greater accident risks than most other railroad workers.

Most brake operators are members of the United Transportation Union.

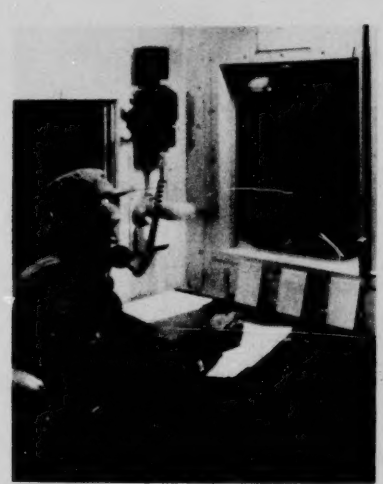
CONDUCTORS

(D.O.T. 198.168)

Nature of the Work

Conductors are in charge of traincrews and are responsible for the safe and punctual delivery of cargo and passengers. Before a train leaves the terminal, the conductor receives instructions on the train's route, timetable, and cargo from the dispatcher, and discusses these with the engineer. On some trains conductors can receive additional instructions by radio while underway. On freight trains, the conductor keeps records of each car's contents and destination, and sees that cars are added and removed at the proper points along the route. On a passenger train, conductors collect tickets and fares, and answer passengers' questions concerning timetables and train rules. At stops they signal engineers when to leave.

During runs, conductors regularly receive information from brake operators on the condition of the cars. If a problem occurs, conductors arrange either for repairs while underway or for removal of the defective car at the nearest station or siding. They inform dispatchers of this development using radio or wayside telephones.



A conductor receives instructions by radio while underway.

Yard conductors supervise the crews that assemble and disassemble trains. They also oversee crews that move cars within railroad yards to facilitate loading and unloading cargo. In yards that have automatic classification systems, they may use electrical controls to operate the track switches that route cars to the correct track.

Training, Other Qualifications, and Advancement

Jobs as conductors are always filled from the ranks of experienced brake operators who have passed tests covering signals, timetables, operating rules, and related subjects. Until permanent positions become available, new conductors are put on the "extra board", where they substitute for experienced conductors who are absent because of illness, vacations, or other reasons. Seniority is almost always the main factor in determining promotion from brake operator to conductor and from the extra board to a permanent position.

Most railroads maintain separate seniority lists for road service and yard service conductors and conductors usually remain in one type of service for their entire careers. On some roads, however, conductors start in the yards, then move freight service, and finally to passenger service. Some conductors advance to managerial positions such as trainmaster or yardmaster.

Employment Outlook

Employment of conductors—who numbered about 39,500 in 1974—is expected to grow slower than the average for all occupations through the mid-1980's. Most job openings will result from the need to replace conductors who are promoted, or who retire or die.

The transportation requirements of the country will increase as growth in population and industry creates a demand for more consumer and industrial products. This will result in an increase in employment of road service conductors, since more trains will be needed to haul the additional freight volume. However, employment growth will be moderated by technological innovations which make it possible to move freight more rapidly. For example, central traffic control systems enable a dispatcher at a central location to control all signals and track switches over a vast section of track. Trains operating under this system spend less time on side tracks waiting for others to pass.

Employment of yard conductors, on the other hand, is not expected to change. Continued modernization of yards, especially the addition of automatic classification systems, will improve yard efficiency. Yard employment also will be affected as railroads use larger, better designed freight cars which take as much time to route as older ones, but carry more freight.

Earnings and Working Conditions

In 1974, conductors had average monthly earnings of $1,205 in yard service, $1,395 in passenger road service, and $1,595 in freight road service. These earnings were more than double the average for all nonsupervisory workers in private industry, except farming.

Yard conductors usually work a 40-hour week and receive premium pay for overtime. Road conductors are under a dual system of pay and are paid according to miles traveled or hours worked, whichever is greater.

Conductors often work nights, weekends, and holidays. Since road service conductors often work on trains that operate between stations that are hundreds of miles apart they may spend several nights a week away from home. Conductors on the extra board frequently work irregular hours totaling less than 40 a week and, therefore, earn less than those who have regular schedules.

Many conductors are members of the United Transportation Union.

LOCOMOTIVE ENGINEERS

(D.O.T. 910.383)

Nature of the Work

Engineers operate locomotives in passenger, freight, and yard services. Road service engineers transport cargo and passengers between stations, while yard engineers move cars within yards to assemble or disassemble trains. Most engineers run diesel locomotives; a few run electrics.

Engineers operate the throttle to start and accelerate the train and use airbrakes to slow and stop it. They also operate other controls, such as light switches, and watch gauges and meters that measure fuel, electricity, and air pressure. They watch for signals that indicate track obstructions and speed limits.

Before and after each run, engineers check locomotives for mechanical problems. Minor adjustments are made on the spot, but major defects are reported to the engine shop supervisor.

Engineers are among the most skilled employees on the railroad. They must have a thorough knowledge of the signal systems, yards, and terminals along their route and be constantly aware of the condition and makeup of the train. Trains react differently to acceleration, braking, and curves, depending on the number of cars, the ratio of empty to loaded cars, or the amount of slack in the train. Misjudgment by the engineer of these or many other factors can lead to whiplash injuries to passengers and crew members, damaged cargo, broken couplers, or even derailment.

Engineers are among the most skilled railroad employees.

Training, Other Qualifications, and Advancement

Openings in engineer jobs are usually filled by training and promoting engineer helpers according to seniority rules. A few railroads train brake operators and inexperienced workers for engineer jobs.

Helpers ride in locomotives with engineers and assist them by inspecting locomotives, watching for signals and track obstructions, and monitoring gauges. New helpers receive on-the-job training lasting up to 6 weeks during which time they learn their duties and railroad rules and regulations. They are then assigned as engineer helpers on regular jobs. Railroads prefer that applicants for helper positions have a high school education and be at least 21 years old. Applicants must have good hearing, eyesight, and color vision. Good eye-hand coordination, manual dexterity, and mechanical aptitude are also required.

Helpers are placed in training programs for engineer jobs within 1 year following their initial hiring date. These programs, which last up to 6 months, include classroom and on-the-job training in locomotive operation. Helpers take qualifying tests covering locomotive equipment, airbrake systems, fuel economy, train handling techniques and operating rules and regulations. They then become eligible for promotion to engineer.

As engineers are needed, qualified helpers who have the longest seniority are placed on the engineers' "extra board." Extra board engineers who do not have regular

assignments substitute for regular engineers who are absent because of vacation, illness, or other reasons. Extra board engineers frequently wait a number of years before accumulating enough seniority to get a regular assignment. Seniority rules also may determine the engineers' type of service; for instance, from a first regular assignment in yard service, they may move to road service.

Engineers take periodic physical examinations to determine fitness to operate locomotives. They must have keen eyesight and hearing. Those who fail to meet the physical standards are restricted to yard service or transferred to other jobs with lower physical standards.

Employment Outlook

Employment of locomotive engineers—who numbered about 37,000 in 1974—is expected to increase more slowly than the average for all occupations through the mid-1980's. Most job openings, however, will arise from the need to replace engineers who retire or die.

The Nation's transportation requirements will increase as growth in population and industry creates a demand for more consumer and industrial products. This will result in an increase in employment of road service engineers, since more trains will be needed to haul the additional freight volume. However, this employment growth will be moderated by technological innovations which make it possible to move freight more rapidly. For example, central traffic control systems enable a dispatcher at a central location to control all signals and track switches over a vast section of track. Trains operating under this system spend less time at sidings waiting for others to pass.

Employment of yard engineers, on the other hand, is not expected to change. Continued modernization of yards, especially the addition of automatic classification systems which electronically route cars to the proper track, will improve yard efficiency. Yard employment will also be affected as railroads use larger, better designed freight cars which take as much time to route as older ones, but carry more freight.

Earnings and Working Conditions

The earnings of engineers depend on the size of the locomotive and type of service. In 1974, monthly earnings of engineers averaged $1,415 in yard service, $1,625 in passenger service, and $1,821 in freight service. Engineers earned two to three times as much as the average for all nonsupervisory workers in private industry, except farming.

Yard engineers work 5 days or more a week, depending on the railroad. They receive premium pay for working more than 8 hours in any day. Road service engineers are under a dual system of pay and are paid by miles traveled or hours worked, whichever is greater. On many railroads, their earnings are limited by the maximum number of miles they can cover per month. Those who reach the limit are replaced by extra board engineers for the rest of the month.

Extra board engineers may work irregular hours since they may be called any time. They are likely to have less work and, therefore, lower earnings than engineers on regular assignments.

Engineers often work nights, weekends, and holidays at regular pay. Those in road service may deliver cargo or passengers to a distant station one day, and not return until the next. Thus, they may spend several days a week away from home.

Most engineers are members of the Brotherhood of Locomotive Engineers; some are members of the United Transportation Union.

SHOP TRADES

Nature of the Work

Shopworkers are the skilled employees who build, maintain, and repair railroad cars, locomotives, and other equipment. In 1974, there were over 75,000 workers in the six principal shop trades—about 41,500 car repairers, 17,500 machinists, 11,500 electrical workers, 5,000 sheet-metal workers, 1,600 boilermakers, and 1,100 blacksmiths.

Car repairers (D.O.T. 622.381) build, maintain, and inspect freight and passenger cars, tank cars, and some sections of locomotives. Repairers visually examine cars and locomotives, and periodically remove and inspect parts such as wheels, brake assemblies, and couplers, looking for defects that might lead to accidents or delays. They make minor repairs on the spot, while more complicated jobs may be done on repair tracks by other car repairers. Some of these employees work in special yards rebuilding old or badly damaged cars. Car repairers use both power tools and handtools.

Machinists (D.O.T. 600.280) use metal cutting and forming tools to do the heavy work involved in servicing and overhauling locomotives and related equipment. *Electrical*

Most car repairers work outside.

workers (D.O.T. 721.381) install and maintain the wiring and electrical equipment in locomotives, cars, and railroad buildings. Some lay and maintain powerlines. *Sheet-metal workers* (D.O.T. 804.281) repair sheet-metal parts on locomotives and other equipment. *Boilermakers* (D.O.T. 805.281) service and repair the pipes and tubes in locomotive engines as well as equipment made of steel plates such as stationary boilers and tanks. *Blacksmiths* (D.O.T. 610.381) repair metal parts and tools. Other craft workers include molders and oilers. (More information about most of these shop trades can be found elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

Although apprenticeship training is the most common way to enter shop trades, some helpers and laborers are upgraded to these jobs. Apprenticeships last 3 to 4 years, depending on how much previous work experience the apprentice has.

Most apprentices are between 18 and 21 years of age, although some are older at the start of their training. On some roads, apprentice applicants must pass mathematical and mechanical aptitude tests.

Applicants who have had shop training in high schools or vocational schools are preferred by most railroads. Automobile repair courses are helpful for car repairers while machining is useful for machinists. Courses in electricity and physics will help applicants who want jobs as electrical workers.

Some workers in the shop trades advance to positions as supervisors in shops, engine houses, and powerplants.

Employment Outlook

Employment of shop trades workers is expected to decline through the mid-1980's as shop efficiency continues to increase and as older railroad cars are replaced with new ones that are more durable and more easily maintained. Job openings, however, will develop for new apprentices or helpers as experienced workers retire, die, or transfer to other fields of work.

Earnings and Working Conditions

In 1974, hourly earnings averaged $5.81 for electrical workers, $5.78 for boilermakers, $5.76 for machinists, $5.72 for blacksmiths, $5.71 for car repairers, and $5.56 for sheet-metal workers. Most shopworkers have a 40-hour workweek and receive premium pay for overtime. Shopwork is active and strenuous, involving stooping, climbing, and lifting. Much of the work, especially that of car repairers, is done outdoors.

Most shopworkers are union members. Among the unions in this field are: Brotherhood of Railway Carmen of the United States and Canada; International Association of Machinists and Aerospace Workers; International Brotherhood of Electrical Workers; Sheet Metal Workers' International Association; International Brotherhood of Boilermakers, Iron Shipbuilders, Blacksmiths, Forgers and Helpers; and the International Brotherhood of Firemen and Oilers. These unions usually negotiate labor-management agreements through the Railway Employees' Department of the AFL-CIO.

SIGNAL DEPARTMENT WORKERS

(D.O.T. 822.281 and .884)

Nature of the Work

Railroad signal workers install, repair, and maintain the train control, communication, and signaling systems that direct train movement and assure safety. The work usually consists of either general maintenance of the signal systems or installation and major repair.

Signal installers work in crews, usually consisting of five or more workers. They install new equipment and make major repairs. Most of their work is construction and includes digging holes and ditches, hoisting poles, and mixing and pouring concrete to make foundations. They also assemble the control and communications devices, make the electrical connections, and perform the extensive testing that is required to assure that new signal systems work properly.

Individual *signal maintainers* are assigned a section of track and are responsible for keeping gate crossings, signals, and other control devices in good operating condition. They periodically inspect and repair or replace wires, lights, and switches. Signal maintainers and skilled installers must have a thorough knowledge of electricity and electronics.

Training, Other Qualifications, and Advancement

New employees are assigned as helpers to installation crews. After about 60 to 90 days of training, helpers are eligible to advance to assistants. After another 2 to 4 years, which may include some classroom instruction, qualified assistants may be promoted to signal installer or maintainer. Assistants usually advance to signal installer, though, since openings in the more desirable maintenance positions usually are filled by senior signal installers. These promotions and assignments are made on the basis of seniority, provided ability is sufficient.

When hiring helpers, railroads prefer applicants who are high school or vocational school graduates. Courses in blueprint reading,

electricity, and electronics provide a helpful background.

Both signal installers and maintainers may be promoted to signal inspector, technician, gang supervisor, and higher supervisory positions. A few eventually become signal engineers.

Employment Outlook

Employment of signal department workers—who numbered about 11,500 in 1974—is not expected to change significantly through the mid-1980's. Nevertheless, some job openings for new workers will arise as experienced workers retire, die, or transfer to other fields.

Signal workers will continue to be needed to repair the existing stock of equipment as well as install and maintain the new signal and train control systems that are planned for the future. Employment is not expected to grow, however, since many new signal systems, which have fewer moving parts, require less maintenance. Also, the more efficient use of track will allow railroads to continue to eliminate some sections of track, reducing the need for maintenance work.

Earnings and Working Conditions

In 1974, signal installers and maintainers averaged $5.86 an hour, about one-third more than the average for all nonsupervisory workers in private industry, except farming. Assistants averaged $4.95 an hour and helpers $4.79 an hour. Most signal workers have a 40-hour week and receive premium pay for overtime.

Signal maintainers must make repairs regardless of weather conditions or time of day. Installers and maintainers often climb poles and work near voltage wires.

Since they work over large sections of track, installers usually live away from home during the workweek, frequently in camp cars provided by the company. Maintainers usually live at home and service signals over a limited stretch of track.

Most signal installers and maintainers are members of the Brotherhood of Railroad Signalmen.

STATION AGENTS

(D.O.T. 211.468. and 910.138)

Nature of the Work

Station agents are the customers' contact with the railroad. Most agents work in small freight stations. They take orders from customers and arrange for railroad cars to transport their products. When goods are delivered they notify the recipient, prepare the bill, and upon payment, authorize release of the goods. They also may pass on train orders and other messages to traincrews. At larger stations, many of these tasks may be done by clerks, telegraphers, and others who are under the agent's supervision.

At passenger stations, agents supervise and coordinate the activities of workers who sell tickets and check baggage. At major freight and passenger stations the agent's duties are primarily administrative and supervisory.

Some agents, sometimes called mobile agents, service several small stations that get little business. They travel from station to station, opening each only long enough to transact the business at hand.

Training, Other Qualifications, and Advancement

Station agents rise from the ranks of other railroad occupations. With sufficient seniority and ability, telephoners, telegraphers, tower operators, and clerks may be promoted to agents in small stations and may advance to larger stations as they gain additional seniority. Agents also may be promoted to managerial positions such as station master or auditor.

Employment Outlook

Employment of station agents—who numbered about 7,600 in 1974—is expected to decline through the mid-1980's as more customer orders and billing are handled by large, centrally located stations, and as an increasing number of smaller stations are serviced by mobile agents. Nevertheless, a limited number of jobs will arise to replace experienced agents who retire, die, or stop working for other reasons.

Earnings and Working Conditions

The earnings of station agents vary. In 1974, agents who also served as telegraphers and telephoners averaged $5.50 an hour, about one-fourth more than the average for nonsupervisory workers in private industry, except farming. Agents in small stations who were not telegraphers averaged $5.96 an hour. Agents in major stations averaged $7.03 an hour. A 40-hour workweek is standard, and time and one-half is paid for overtime.

Station agents, except for some supervisory agents, are members of the Brotherhood of Railway, Airline and Steamship Clerks, Freight Handlers, Express and Station Employees.

Glass enclosed towers provide tower operators with a clear view of the track below.

TELEGRAPHERS, TELEPHONERS, AND TOWER OPERATORS

(D.O.T. 236.588 and 910.782)

Nature of the Work

Telegraphers, telephoners, and tower operators control movement of trains according to instructions given by train dispatchers. Tower operators work in towers located in yards or next to major junctions. They route train traffic by manipulating levers and other controls to activate signals and throw switches on the track below.

Telegraphers and telephoners receive orders on train movement and cargo—such as routing instructions, cars that must be picked up, or the condition of the track ahead—and pass this information on to train crews, verbally or in written instructions. They work at stations and may assist station agents in taking orders and billing customers.

Training, Other Qualifications, and Advancement

New telegraphers, telephoners, and tower operators get on-the-job training that covers operating rules, train orders, and station operations. On most roads, trainees must pass examinations on train operating rules and demonstrate ability to use the equipment before they can qualify. Newly qualified workers usually are assigned to the "extra board" to work as substitutes for telegraphers, telephoners, and tower operators who are absent due to vacations, illness, or other reasons. After gaining enough seniority, they generally can bid for regular assignments.

Most railroads prefer applicants who are high school graduates or the equivalent. Good hearing and eyesight, including normal color vision, are required. Applicants should be responsible, alert, and capable of organizing thoughts and actions in emergency or pressure situations.

Some telegraphers, telephoners, and tower operators may advance to positions such as station agent or train dispatcher.

Employment Outlook

Employment of telegraphers, telephoners, and tower operators—who numbered about 11,000 in 1974—is expected to decline through the mid-1980's. Nevertheless, a small number of new workers will be hired to replace experienced workers who retire, die or change occupations.

Employment in these fields will continue to decline as technological developments increase worker

productivity through the wider use of mechanized yard operations, centralized traffic control, and other automatic signaling and control systems.

Earnings and Working Conditions

In 1974, hourly earnings for telegraphers, telephoners, and tower operators averaged $5.36, about one-fourth more than the average for all nonsupervisory workers in private industry, except farming.

A 40-hour week is standard, and time and one-half is paid for overtime. Under Federal law, railroad telegraphers generally cannot work more than 9 hours in any one day, except in emergencies.

Most telegraphers, telephoners, and tower operators are members of the Brotherhood of Railway, Airline and Steamship Clerks, Freight Handlers, Express and Station Employees.

TRACK WORKERS

(D.O.T. 182.168, 859.883, 869.887, 910.782, and 919.887)

Track worker helps lay welded rail.

Nature of the Work

Track workers construct, service, and repair railroad tracks and roadways. Most track workers work as members of large, heavily mechanized traveling crews which do scheduled preventive maintenance and major repair work over a large section of track. Many of these workers operate heavy machinery, such as bulldozers, cranes, and machines which lay rail, replace ties, or clean ballast. Others use power tools to drive and pull spikes, cut rails, tighten bolts, and perform many other functions. Handtools, such as picks and shovels, are used less frequently.

Section crews are smaller and less mechanized than the traveling ones and do less extensive repairs. They are assigned a smaller section of track to keep in condition between the major overhauls of the traveling crews. Section workers regularly inspect the track and roadway, and repair or replace malfunctioning switches, weak ties, cracked rails, washouts, and other defects.

Training, Other Qualifications, and Advancement

Most track workers learn their skills through on-the-job training that lasts about 2 years. Machine-operating jobs are assigned to qualified workers by seniority.

Railroads prefer applicants who can read, write, and do heavy work. Applicants may be required to pass physical examinations.

Some track workers who have the necessary seniority and other qualifications may advance to gang or section supervisor, then to positions such as track supervisor.

Employment Outlook

Employment of track workers—who numbered about 57,000 in 1974—is not expected to change through the mid-1980's. Nevertheless, additional track workers will be needed each year to replace those who retire, die, or transfer to other occupations. Most job openings will be in traveling crews.

Railroads are expected to upgrade much of the right-of-way dur-

ing the next decade. The extent of this upgrading will determine employment needs. Employment may increase in the short run if funds for track renovation become available through government action. However, over the long run, increased productivity of track workers—as machines do more of the work—will moderate employment needs. Employment will also be affected as railroads continue to close some sections of track which are unprofitable or are made unnecessary as the installation of improved train control systems enables railroads to use less track.

Earnings and Working Conditions

In 1974, track workers averaged $4.96 an hour, slightly more than the average for all nonsupervisory workers in private industry, except farming. Equipment operators and helpers averaged $5.38 and crew supervisors averaged $5.81 an hour. A 40-hour workweek is standard, and premium rates are paid for overtime.

Track workers on traveling crews may have to commute long distances to reach the worksite. Many, however, live in camp cars or trailers provided by the railroads. Workers on section crews sometimes have to perform emergency repairs at night during bad weather conditions. Track workers have strenuous and active jobs. Much of the time they use moderately heavy tools and work in bent and stooped positions.

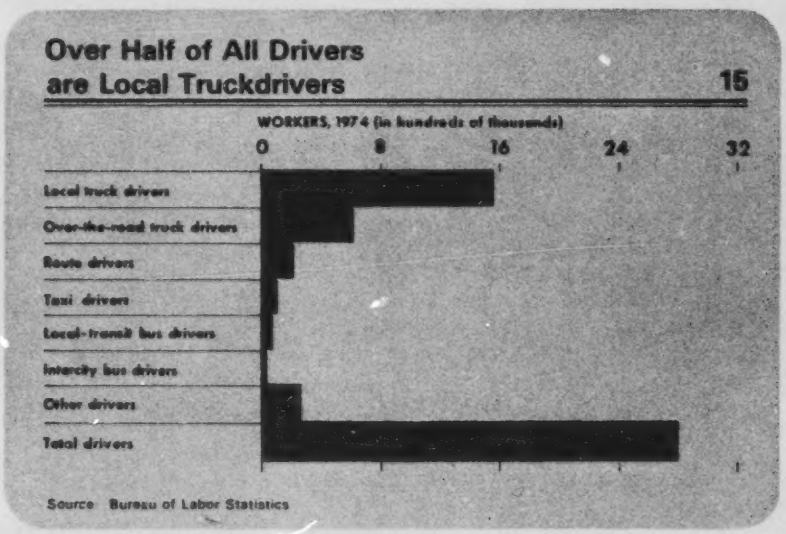
Most track workers are members of the Brotherhood of Maintenance of Way Employees.

DRIVING OCCUPATIONS

Nearly 2.8 million truck, bus, and taxi drivers moved passengers and goods over highways and city streets in 1974. Some drivers are behind the wheel practically all their working time. Others spend part of the time loading and unloading goods, making pickups and deliveries, and collecting money. Still others, like route drivers, are combination driver-salesworkers. (Route drivers are discussed in the chapter on Sales Occupations elsewhere in the *Handbook*.) The individual statements that follow cover long-distance and local truckdrivers, intercity and local busdrivers, parking attendants, and taxi drivers. They do not cover school busdrivers, chauffeurs, ambulance drivers, or employees whose driving is incidental to their regular duties.

Through the mid-1980's employment of long-distance and local truckdrivers is expected to expand as more and more freight is moved by trucks. Employment in other driving occupations is not expected to change much, but many new employees will be hired to replace those who retire, die, or stop working for other reasons.

Driving jobs offer excellent opportunities for persons who are not planning to attend college. The pay for most drivers is relatively high, and working conditions are fairly good. Many persons also will enjoy the freedom from close supervision and the frequent contacts with people which are characteristic of most driving jobs.



INTERCITY BUSDRIVERS

(D.O.T. 913.363 and 913.463)

Nature of the Work

In many smaller towns and cities, buses provide the only public transportation to other communities. In large cities, they are an alternative to railroad and airline transportation and in many cases, provide more frequent service.

When busdrivers report to the terminal, they are assigned buses and pick up tickets, change, report blanks, and other items needed for their trips. They inspect their buses carefully to make sure the brakes, steering mechanism, windshield wipers, lights, and mirrors work properly. They also check the fuel, oil, water, and tires, and make certain that the buses are carrying safety equipment, such as fire extinguishers, first-aid kits, and emergency reflectors.

Drivers move the buses to loading platforms where they take on passengers. They collect fares—tickets usually—as passengers board the buses and may use the buses' public address system to announce the destination, route, time of arrival and other information concerning the trips.

Although drivers must always be alert in preventing accidents, they must be especially careful in fast moving highway traffic. They must operate the bus at safe speeds, and must cope with adverse road conditions. Before arriving at major terminals, they announce the stop and the scheduled departure time. At some small stations, drivers stop only if they see passengers waiting or if they have been told to pick up or deliver freight. Drivers also regulate lighting, heating, and air-conditioning equipment for the passengers' comfort. In an emergency, they are required to change flat tires.

Upon arriving at their final destinations, drivers may unload or supervise the unloading of baggage and freight. They prepare reports for their employers on mileage, time, and fares, as required by the U.S. Department of Transportation. They also report any repairs the buses need before being used again.

At times, drivers operate chartered buses. In these cases, they pick up a group of people, take them to the group's destination, and remain with them until they are ready to return. These trips frequently require drivers to remain away from home one night or more.

Places of Employment

Over 25,000 intercity busdrivers were employed by about 950 bus companies in 1974. Some work out of terminals in the many small communities served by buses, but most work out of major terminals in large cities.

Training, Other Qualifications, and Advancement

Intercity busdrivers must meet qualifications established by the U.S. Department of Transportation. Drivers must be at least 21 years old and be able to read, write and speak English well enough to communicate with passengers and to complete reports. They also must have good hearing, at least 20/40 vision in each eye, with or without glasses, and normal use of their arms and legs. In addition, they must take comprehensive written examinations which test their knowledge of Department of Transportation and State motor vehicle regulations, as well as a driving test in the type of bus they will operate.

Many intercity bus companies have considerably higher requirements. Most prefer applicants who are at least 25 years of age; many prefer applicants who have bus or truck-driving experience. One large company requires applicants to have 20/20 vision with or without glasses.

Since they represent their companies in dealing with passengers, busdrivers must be courteous and tactful. Even temperaments and emotional stability are important qualifications, because driving buses in heavy, fast-moving traffic and dealing with passengers may cause mental strain.

Most intercity bus companies conduct training programs for new drivers. These programs, which usually last from 2 to 6 weeks, include both classroom and driving instruction. In the classroom, trainees learn about rules of the company and the U.S. Department of Transportation, about State and municipal driving regulations, and about safe driving practices. They also learn how to determine ticket prices and how to keep records. In addition, new employees learn to deal courteously with passengers.

After completing classroom work, trainees ride with regular drivers to observe safe driving practices and other aspects of the job. They also make trial runs, without passengers, to improve their driving skills. After completing the training, which includes final driving and written examinations, new drivers begin a "break in" period. During this period, they work under strict supervision and make regularly scheduled trips with passengers.

New drivers start out on the "extra board," which is a list of drivers who are given temporary assignments. While on this list, they may substitute for regular drivers who are ill or on vacation, or they may drive chartered buses. Extra drivers may have to wait several years before they have enough seniority to get a regular assignment.

Opportunities for promotion generally are limited, particularly in small companies. For most drivers, advancement consists of receiving better driving assignments with higher earnings. Experienced drivers may be promoted to jobs as dispatchers, supervisors, or terminal managers.

Employment Outlook

Little or no change in the number of intercity busdrivers is expected through the mid-1980's. Several hundred job openings, however, will become available each year because of the need to replace experienced drivers who retire or die. Additional openings will arise as some drivers transfer to other occupations. Since many qualified persons are attracted to this relatively high paying job, applicants can expect stiff competition for the openings that arise. Applicants in excellent physical condition who have good driving records and sales experience, or other experience working with people, stand the best chance of being hired.

Because of competition from airlines and private automobiles intercity bus travel is not expected to grow significantly. However, should government energy policies make gasoline for automobiles very expensive, or difficult to obtain, many persons may ride buses rather than drive their own cars, thus increasing the demand for intercity busdrivers.

Earnings and Working Conditions

Drivers employed by large intercity bus companies had estimated annual average earnings of $14,100 in 1974, about two-thirds more than the average for all nonsupervisory workers in private industry, except farming. The wages of intercity busdrivers typically are computed on a mileage basis, but short runs may be on an hourly rate. Most regular drivers are guaranteed a minimum number of miles or hours per pay period. For work on other than regular assignments they receive additional pay, customarily at premium rates.

Since intercity buses operate at all hours of the day and every day of the year, drivers may work nights and weekends. Extra drivers may be on call at all hours and may be required to report for work on very short notice. Driving schedules may range from 6 to 10 hours a day and from 3-1/2 to 6 days a week. However, U.S. Department of Transpor-

tation regulations specify that intercity drivers shall not drive more than 10 hours without having at least 8 hours off, and shall not drive at all after being on duty for 15 hours.

Driving an intercity bus usually is not physically difficult, but it is tiring and requires steady nerves. The busdriver is given a great deal of independence in his job, and is solely responsible for the safety of the passengers and bus. Many drivers like working without direct supervision and take pride in assuming these responsibilities. Some also enjoy the opportunity to travel and to meet the public.

Most intercity busdrivers belong to the Amalgamated Transit Union. The Brotherhood of Railroad Trainmen, and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.) also have organized these workers in some areas of the country.

Sources of Additonal Information

For further information on job opportunities in this field, contact intercity bus companies or the local office of the State employment service.

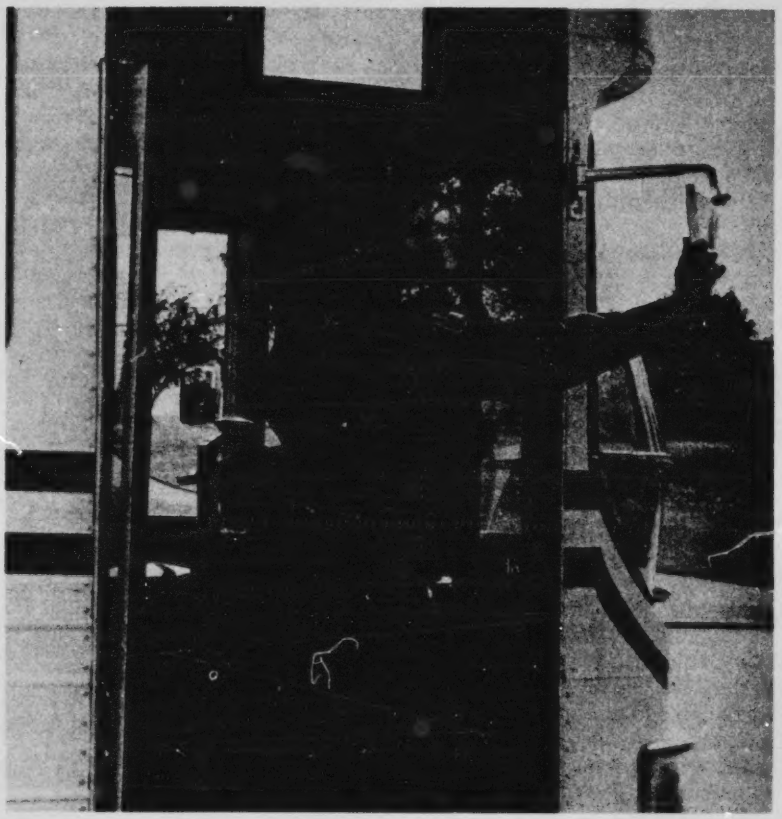
LOCAL TRANSIT BUSDRIVERS

(D.O.T. 913.363 and 913.463)

Nature of the Work

Local transit busdrivers transport millions of Americans to and from places of work and various other destinations every day. These drivers follow definite time schedules and routes over city and suburban streets to get passengers to their destinations on time.

The workday for local busdrivers begins when they report to the terminal or garage. There, they receive assignments, transfer and refund forms and obtain the buses they drive. Drivers inspect the inside and outside of the buses and check the tires, brakes, windshield wipers, and lights before starting their runs. Those who work for small bus companies also may check the water, oil, and fuel.



More local bus drivers will be needed to relieve traffic congestion.

On most runs, drivers pick up and discharge passengers at locations marked with a bus stop sign. As passengers board the bus, drivers make sure the correct cash fare, token, or ticket is placed in the fare box. They also collect or issue transfers. Drivers often answer questions about schedules, routes, and transfer points, and sometimes call out the name of the street at each bus stop.

At the end of the day, busdrivers turn in trip sheets which usually include a record of fares received, trips made, and any significant delays in schedule. In case of an accident, drivers must obtain the names, addresses, and phone numbers of persons on the bus and make a detailed report.

At times, drivers operate chartered buses. In these cases, they pick up a group of people, take them to the group's destination, and remain with them until they are ready to return.

Places of Employment

About 71,000 local busdrivers were employed in 1974. About four-fifths worked for publicly owned transit systems. Most of the remainder worked for privately owned transit lines; a small number worked for sightseeing companies.

Most busdrivers work in large cities.

Training, Other Qualifications, and Advancement

Applicants for busdriver positions should be at least 21 years old, of average height and weight, and have good eyesight—with or without glasses. Applicants must be in good health and must pass the written and physical examinations given by most employers. Because drivers often work under the pressure of congested traffic conditions and deal with many different personalities, emotional stability is important. Although educational requirements are not high, many employers prefer applicants who have a high school education or its equivalent.

A motor vehicle operator's license, and generally 1 or 2 years of driving experience on some type of large vehicle are basic requirements. A good driving record is essential because the busdriver is responsible for passenger safety. Most States require busdrivers to have a chauffeur's license.

Most local transit companies conduct training courses which may last several weeks and include both classroom and "behind-the-wheel" driving instruction. In the classroom, trainees learn company rules, safety regulations, and safe driving practices. They also learn how to keep records and how to deal tactfully and courteously with passengers. Actual driving instruction consists of supervised trips both with and without passengers. At the end of the course, trainees may have to pass a written examination and a driving examination.

New drivers are often placed on an "extra" list to substitute for regular drivers who are ill or on vacation and to make extra trips during morning and evening rush hours. "Extra list" drivers also may drive charter or sightseeing runs, and other extra runs such as special buses for taking passengers to sporting events. They remain on the extra list until they have enough seniority to get a regular run, which may take several months or more than a year.

Opportunities for promotions generally are limited, although experienced drivers may advance to jobs such as instructor, supervisor or dispatcher. Promotion in publicly owned bus systems is usually by examination.

Employment Outlook

Employment of local busdrivers is expected to increase more slowly than the average for all occupations through the mid-1980's. However, many job openings will result from the need to replace drivers who transfer to other occupations, retire, or die. Since the pay is relatively good and few training or experience requirements exist, applicants can expect stiff competition from many other qualified persons for available jobs. Applicants with good driving records and experience in driving large vehicles have the best chance of being hired.

The increased use of privately owned automobiles in cities and the population shift to the suburbs where most people drive their own cars has caused a decline in bus passengers and driver employment. However, in urban areas the automobile is now recognized as the main source of air pollution and traffic congestion. To reduce the number of cars used by commuters, many cities are trying to improve local bus service. Some cities now have commuter buses with reserved seats. Express lanes reserved for buses on city streets, more convenient routes, and more comfortable buses reflect the impact of Federal, State and local government interest in providing better bus service. Improved bus service will require more drivers.

Earnings and Working Conditions

According to a survey of union contracts in 65 large cities, local busdrivers averaged $5.55 an hour in 1974, about one-fourth more than the average for all nonsupervisory workers in private industry, except farming. Hourly wages were highest in the larger cities. Wage scales for beginning drivers were generally 10 to 20 cents an hour less.

The workweek for regular drivers usually consists of any 5 consecutive days; Saturdays and Sundays are counted as regular workdays. Some drivers have to work evenings and after midnight. To accommodate the demands of commuter travel, many local busdrivers have to work "split shifts." For example, a driver may work from 6 a.m. to 10 a.m., go home and then return to work from 3 p.m. to 7 p.m. Drivers may receive extra pay for split shifts.

Driving a bus is not physically strenuous, but busdrivers may suffer nervous strain from maneuvering a large vehicle through heavy traffic while dealing with passengers. However, local busdrivers enjoy steady year-round employment, and work without close supervision.

Most local busdrivers are members of the Amalgamated Transit Union. Drivers in New York City and several other large cities belong to the Transport Workers Union of America. The Brotherhood of Railroad Trainmen and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.) also have organized some local busdrivers.

Sources of Additional Information

For further information on employment opportunities, contact a local bus company or the local office of the State employment service.

LOCAL TRUCKDRIVERS

(D.O.T. 900.883, 902.883, 903.883, 906.883, and 909.883)

Nature of the Work

Although goods from near and far may begin their trip to customers by trucks, trains, ships, or planes, final deliveries almost always are made by truck. Local truckdrivers move goods from terminals and warehouses to factories, stores, and homes in the area. They are skilled drivers who can maneuver trucks into tight parking spaces, through narrow alleys, and up to loading platforms.

When local truckdrivers arrive at the terminal or warehouse, they receive assignments to make deliveries, pickups, or both. They also get delivery forms and check the condition of their trucks. Before the drivers arrive for work, material handlers generally have loaded the trucks and arranged the items in order of delivery to minimize handling of merchandise.

At the customer's place of business, drivers generally load and unload the merchandise. If there are heavy loads such as machinery, or if there are many deliveries to make during the day, drivers may have helpers. Drivers of moving vans usually have crews of helpers to assist in loading and unloading household or office furniture.

Drivers get customers to sign receipts for the goods, and may receive money for the material delivered. At the end of the day, they turn in receipts, money, and records of the deliveries made. They also report whatever repairs the trucks need before being used again.

Some of these workers drive special types of trucks, such as dump or oil trucks, which require the operation of mechanical levers, pedals, or other equipment. If they haul large or heavy items, they operate mechanical hoists to load and unload the material from the trucks.

About 1.6 million people had jobs as local truck drivers in 1974.

Places of Employment

About 1.6 million people worked as local truckdrivers in 1974, mostly in and around large cities. However, they work in all communities.

Most local drivers work for businesses which deliver their own products and goods—such as department stores, foodstores, and lumber yards. Many others are employed by trucking companies; some work for Federal, State, and Local government agencies.

A large number of local truckdrivers are owner-operators. Drivers who own one or two trucks account for a sizable proportion of the local for-hire trucking industry.

Training, Other Qualifications, and Advancement

Qualifications for local truckdrivers vary considerably, depending upon the type of truck and the nature of the employer's business.

In most States, however, applicants must have a chauffeur's license, which is a commercial driving permit. Information on how to get this license can be obtained from State Motor Vehicle Departments. Knowledge of traffic laws is necessary, and some previous experience in driving a truck is helpful. A person may obtain such experience by working as a truckdriver's helper. Employers also give consideration to driving experience gained in the Armed Forces.

Applicants may have to pass a general physical examination, a written examination on driving regulations, and a driving test. They should have good hearing and a least 20/40 vision, with or without glasses, be able to lift heavy objects, and be in good health. Since drivers often deal directly with the public, the ability to get along well with people also is important. Many employers will not hire applicants who have bad driving records.

Training given to new drivers is often informal, and may consist only of riding with and observing an experienced driver. Additional training may be given if they are to drive a special type of truck. Some companies give 1 to 2 days of classroom instruction which covers general duties, the efficient operation and loading of a truck, company policies, and the preparation of delivery forms and company records.

Although most new employees are assigned immediately to regular driving jobs, some start as extra drivers and do the work of regular drivers who are ill or on vacation. They receive a regular assignment when an opening occurs.

Local truckdrivers may advance to supervisor, dispatcher, manager, or to traffic work—for example, planning delivery schedules. However, relatively few of these jobs are available. For the most part, a local truckdriver may advance by driving heavy or special types of trucks or by transferring to long-distance truckdriving. Experienced drivers who have business ability can become owner-operators when they have enough money to purchase a truck.

Employment Outlook

Although employment is expected to increase more slowly than the average for all occupations through the mid-1980's, opportunities for employment as a local truckdriver generally are favorable. In addition to the job openings from growth, thousands of openings will result from the need to replace experienced drivers who transfer to other occupations, retire, or die. Job openings may vary from year to year, however, since the number of drivers needed fluctuates with general business conditions. Applicants with good driving records have the best chance of being hired.

The rise in total business activity anticipated in the years ahead will increase the amount of freight to be distributed. Since trucks carry virtually all local freight, employment of drivers will grow, but not as fast as the increase in freight. In many cases, trucks are not fully loaded when they make deliveries; thus, more goods can be handled without increasing the number of trucks or drivers.

Earnings and Working Conditions

On the average, union wage scales were $6.39 an hour for local truckdrivers and $5.84 an hour for helpers in 1974 according to a survey in 68 large cities. This is about one and one-half times as much as the average for all nonsupervisory workers in private industry, except farming.

As a rule, local truckdrivers are paid by the hour and receive extra pay for working overtime, usually after 40 hours. Some drivers are guaranteed minimum daily or weekly earnings. Local truckdrivers frequently work 48 hours or more a week. Night or early morning work is sometimes necessary, particularly for drivers handling foodstuffs for chain grocery stores, produce markets, or bakeries. Most drivers deliver over regular routes, although some may be assigned different routes each day.

Truckdriving has become less physically demanding because of power steering, more comfortable seating, improved ventiliation and cab design, but when drivers make many deliveries during a day, their work can be exhausting. Morever, driving in heavy traffic can cause nervous strain. Local truckdrivers, however, do have certain work advantages. Employment is steady and, unlike long-distance drivers, they usually work during the day and return home in the evening.

Many local truckdrivers are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.) Some local truckdrivers employed by companies outside the trucking industry are members of unions that represent the plantworkers of their employers.

Sources of Additional Information

Information on career opportunities in the trucking industry may be obtained from:

American Trucking Associations, Inc., 1616 P St. NW., Washington, D.C. 20036.

For details on truck driver employment opportunities, contact local trucking companies or the local office of the State employment service.

LONG-DISTANCE TRUCKDRIVERS

(D.O.T. 903.883, 904.883, 905.883, and 909.883)

At all hours of the day and night big trucks travel along turnpikes and highways carrying a wide variety of goods between terminals that are hundreds, or even thousands of miles apart. Behind the wheel are the top professional drivers. They drive the largest and most expensive equipment and receive the highest wages of all drivers.

In most cases, dispatchers tell long distance drivers when to report for work and where to take the truck. Although many drivers work

during the day, night travel is common and frequently preferred because the roads are less crowded and trips take less time. Trucks already have been loaded and serviced with fuel and oil when the drivers report for work.

Before moving from the terminal, drivers inspect the trucks to make sure they will operate safely. For example, they make sure the brakes, windshield wipers, and lights work properly and that a fire extinguisher, flares, and other safety equipment have been loaded. Mirrors are adjusted so that both sides of the truck are visible from the driver's seat. Drivers also make sure the cargo has been loaded properly and will not shift after the trip has begun. If some equipment does not operate properly, or is missing, or if the cargo is not loaded properly, drivers report the problem to the dispatcher for correction.

Once they start the truck moving, drivers must be alert to prevent accidents. They must be careful when going through narrow spaces to allow enough room for the long trailers. Since truck seats are higher than seats in most cars, drivers can see far down the road. They seek traffic lanes that allow trucks to move at a steady speed, and when going downhill they may increase speed slightly to gain momentum for a hill ahead.

After traveling for several hours, drivers may stop to eat, refuel, and relax. When drivers have reached their destination and have parked at the unloading platform, they complete reports about the trip and the condition of the truck. Both are required by the U.S. Department of Transportation. When drivers have an accident, a detailed report is required.

Drivers are generally off duty before they pick up another truck to drive back to their home city, or in some cases, to another city.

Long-distance truckdrivers spend most of their working time behind the wheel, although some also handle freight. For example, drivers of long-distance moving vans may load and unload furniture.

Places of Employment

An estimated 540,000 long-distance drivers were employed in 1974. Most live near large cities and manufacturing centers which have many truck terminals. Drivers who specialize in transporting agricultural products or minerals may live in rural areas.

A large proportion of long-distance truckdrivers work for trucking companies that serve the general public. Many others work for companies such as furniture manufacturers, which own and operate trucks to deliver their products. A significant number of drivers are owner-operators.

Training, Other Qualifications, and Advancement

The U.S. Department of Transportation establishes minimum qualifications for long-distance truckdrivers engaged in interstate commerce. A driver must be at least 21 years old and pass a physical examination which the employer usually pays for. Good hearing, 20/40 vision with or without glasses, normal use of arms and legs (unless a waiver is obtained), and normal blood pressure are the main physical requirements.

To be hired, drivers must have a good driving record and must pass a road test to show they can operate a vehicle of the type and size they will drive in regular service. In addition, they must take a written examination on the Motor Carrier Safety Regulations of the U.S. Department of Transporatation. In most States, truckdrivers also must have a chauffeur's license from the State Motor Vehicle Department.

Many fleet operators have higher hiring standards than those described. Many firms specify height and weight limitations; other companies employ only applicants who have had several years' experience driving trucks long distances.

Driver training courses are a common method of preparing for truckdriving jobs. Most training authorities and employers recommend high school driver-training courses. In addition, a high school course in automotive mechanics helps drivers make minor roadside repairs.

A small number of private technical-vocational schools offer truckdriving courses. Students learn to inspect the trucks and freight, to drive large vehicles in crowded areas and in highway traffic, and to comply with Federal, State, and local regulations. Completion of a course, however, does not assure a job; interested persons should check with local trucking companies to make sure the school's training is acceptable.

All employers are interested in obtaining good, safe, reliable drivers. Some only select applicants with safe driving records; others hire on the basis of personal interviews. New drivers usually are given a brief explanation of company policy and the preparation of various forms used on the job. They then make one or more training trips under the supervision of an instructor or an experienced driver.

Drivers for large trucking companies frequently start on the "extra board," bidding for regular runs on the basis of seniority as vacancies occur. (The extra board is a list of drivers, assigned in rotation, who substitute for regular drivers or who make extra trips when necessary.) Drivers for smaller companies are more likely to begin with assigned regular routes.

Opportunities for promotion in this occupation are limited. A few drivers may advance to jobs as safety supervisor, driver supervisor, and dispatcher. However, such jobs are often unattractive to long-distance truckdrivers, since the starting pay is usually less than the pay for driving jobs. Although most drivers can only expect to advance to driving runs that provide increased earnings or preferred schedules and working conditions, those with business ability and enough money to buy a truck may become owner-operators.

Employment Outlook

Employment of long-distance truckdrivers is expected to increase more slowly than the average for all occupations through the mid-1980's. In addition to jobs from employment growth, thousands of openings will be created in this large occupation as experienced drivers retire, die, or transfer to other fields of work. Job opportunities may vary from year to year, however, because the amount of freight moved by trucks flucuates with ups and downs in the economy. Since driver earnings are high and no formal training is required, applicants can expect to face strong competition for available jobs. Applicants with previous driving experience usually are the first hired.

The general economic growth of the Nation is expected to increase the amount of freight carried long distances by truck, thus increasing the demand for drivers. However, the demand for drivers is expected to increase more slowly than the growth in freight. Larger trucks, increased use of railroad cars to transport loaded trucks—piggyback service—and reduced government regulations should increase the amount of freight each driver moves annually.

Earnings and Working Conditions

Based on limited information, drivers employed by large trucking companies had annual average earnings of about $18,300 in 1974, about double the average of all nonsupervisory workers in private industry, except farming. Pay rates are fairly uniform because this field is highly unionized, and union contracts are generally master agreements covering all employers within a multi-State region.

The earnings of an individual driver are affected by mileage driven, number of hours worked, type of truck, and the weight of loads. Earnings also are affected by the nature of the cargo; premium rates are paid for flammable or otherwise hazardous commodities.

Some companies outside the trucking industry, such as bakeries and dairies, may pay drivers on the same basis as other employees—a monthly, weekly, or daily wage. Generally, such a wage is for a specified number of hours, and, if drivers work additional hours, they receive extra pay.

Trucking companies engaged in interstate commerce are subject to the U.S. Department of Transportation rules governing hours of work and other matters. These regulations limit the hours drivers may work and assure a reasonable amount of time for rest. For example, a driver cannot be on duty for more than 60 hours in any 7-day period, and cannot drive more than 10 hours without being off duty at least 8 hours. Many drivers, particularly on very long runs, work fairly close to the maximum hours permitted. A workweek of at least 50 hours is very common.

Long-distance truckdrivers often must spend time away from home. In such instances, the company provides lodging either in a company dormitory or a hotel or motel. Some companies use two drivers on very long runs. One drives while the other sleeps in a berth behind the cab. Although earnings on "sleeper" runs are the highest in the field, the work is very tiring and requires being away from families and friends for days and even weeks at a time.

The physical strain of long-distance driving has been reduced by more comfortable seating, improved ventilation and cab design, better highways, and more stringent safety regulations. However, the noise and vibration of the truck and the nervous strain of sustained driving are tiring.

Most long-distance drivers are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Some drivers outside the trucking industry belong to the unions that represent plant employees of the companies for which they work.

Sources of Additional Information

Information on career opportunities in the trucking industry may be obtained from:

American Trucking Associations, Inc., 1616 P St. NW., Washington, D.C. 20036.

Additional details on truckdriver employment opportunities may be obtained from local trucking companies or local offices of the State employment service.

PARKING ATTENDANTS

(D.O.T.915.878)

Nature of the Work

Parking attendants park customers' cars and collect payment for the time they are left on the lot or in the garage. Attendants meet incoming cars and record their time of arrival on numbered claim checks. One part of the check is placed on the car's windshield and the other is given to the driver to reclaim his car.

Some parking attendants ask customers when they expect to return so they can put the car in either the front or the back of the lot. This information is especially important for an attendant working on a lot where cars are parked bumper to bumper rather than in easily accessible rows.

Attendants usually drive the cars to and from vacant spaces, but at some facilities they tell drivers where to park. Attendants working in multilevel garages may be assigned to only one level, but the usual practice is for attendants to work all levels and use a moving manlift belt for transportation between floors.

Some parking lots require customers to pay when entering the lot and usually charge a flat fee for the day or evening. Others charge by the hour and attendants must determine the correct amount owed by each customer. In large establishments, a cashier, rather than an attendant, may collect payments.

Slack periods are common at most parking facilities and attendants may be required to perform routine maintenance jobs or wash and wax cars when they are not busy.

Places of Employment

About 40,000 parking attendants—nearly all of them men—were employed in 1974. Parking attendants work in facilities ranging from small outdoor lots to large parking garages. Most lots and garages are commercial establishments and in urban areas they often are part of citywide chains. Although some restaurants, hotels, airports, and stores maintain their own lots, the usual practice is to rent parking space for their customers in commercial garages. Some cities own and operate their own lots in downtown areas.

More than a third of all parking attendants work part time, usually during busy morning and evening hours. Many part-time attendants are students.

Training, Other Qualifications, and Advancement

Although there are no specific educational requirements for parking attendants, employers prefer high school graduates. Parking attendants must have a valid driver's license, be able to drive all types of cars, and have good eyesight and peripheral vision. The ability to keep records of claim tickets, compute parking charges, and make change also is important.

Attendants should be in good physical condition because the work involves long periods of standing and can be tiring when many cars must be moved in a hurry. Parking attendants should be neat, tactful, and courteous when dealing with the public.

Many employers offer on-the-job training programs that review proper driving techniques and explain company policy on record-keeping procedures and damage claims. These courses usually include tips on how to maintain good customer relations.

Parking attendants have limited opportunities for advancement, although they may become managers or supervisors of parking facilities.

Employment Outlook

Employment of parking attendants is expected to grow more slowly than the average for all occupations through the mid-1980's as the trend to self-parking systems continues. Parking lot owners prefer the self-park method because it is less costly and because most customers prefer to park their own cars rather than wait for a busy attendant. Employment growth also will be limited by the recent slowdown in the construction of parking facilities.

Although employment growth is expected to be slow, the need to replace workers who die, retire, or transfer to other occupations will create some job openings each year. Part-time and evening work will be available. Most job opportunities will be in large commercial parking lots in urban areas.

Earnings and Working Conditions

Although all parking attendants are not covered by minimum wage provisions, in 1974 most had hourly earnings near the $1.90 minimum required by State and Federal laws. According to the limited data available, attendants who are union members earn between $2.10 and $3.25 an hour in urban areas, but most attendants are not union members. Nearly all attendants receive tips in addition to wages

that add substantially to their income.

Many parking attendants receive fringe benefits such as life, health, and disability insurance; paid vacations; a Christmas bonus; and profit sharing. Some companies furnish uniforms. Attendants often work long hours, however. A 10-hour day and work at nights, on weekends, and on holidays are not unusual. In addition, many attendants spend much time outdoors in all kinds of weather and constantly breathe automobile exhaust fumes. In some places, attendants are responsible for any damage they do to customers' cars.

The principal union organizing parking attendants is the International Brotherhood of Teamsters, Chauffeurs, Warehousemen, and Helpers of America.

Sources of Additional Information

For general information about the parking industry, write:

National Parking Association, 1101 17th St. NW., Washington, D.C. 20036.

TAXICAB DRIVERS

(D.O.T. 913.363)

Nature of the Work

In practically all communities, taxicabs are an essential part of the public transportation system. Since they operate without fixed routes or schedules, they offer individualized transportation service not otherwise available.

Many taxicab companies have cabs with two-way radios so dispatchers can tell drivers where to pick up passengers who call for service. Another method to get passengers is for drivers to wait at cabstands for telephone calls from the dispatching office. Drivers in large cities may drive around busy areas and watch for potential customers or may wait at hotels, bus terminals, and other places where business will be good. Smart drivers keep informed on where crowds are likely to gather. For example, drivers may go to stations when trains are scheduled to arrive so that they are on hand to pick up passengers getting off the train.

Occasionally, drivers may assist passengers in and out of the cab and may handle their luggage. In some communities, drivers regularly transport crippled children to and from school. Cab drivers also may provide sightseeing tours for out-of-town visitors and may pick up and deliver packages.

Drivers have to keep records of such basic facts as the date, time, and place passengers were picked up and their destination, time of arrival, and fare. In small companies, drivers often are responsible for cleaning the cab.

Places of Employment

In 1974, about 92,000 taxicab drivers worked full time in the taxicab industry. Although taxicab drivers are employed in all but the smallest cities, employment is concentrated in large cities. About one-fifth of all full-time taxi drivers work in New York City.

Training, Other Qualifications, and Advancement

To become a taxi driver, applicants are usually required to have a State-issued chauffeur's license and a special taxicab operator's license issued by the local police, safety department, or Public Utilities Commission. Although taxicab operator licensing requirements vary considerably among cities, applicants generally must be in good health, have a good driving record, and not have been convicted of a serious crime.

Most large communities require an applicant for a taxi driver's license to pass a written examination on taxicab and traffic regulations. The examination may include questions on street locations, insurance regulations, accident reports, lost articles, and zoning or meter rules. In some cities, the cab company will teach applicants taxicab regulations and the location of streets and important buildings. In other cities, applicants must prepare themselves for the examination.

Taxi driver gets instructions to pick up passengers from a dispatcher.

Although there are no minimum education requirements, many companies prefer applicants to have a least an eighth-grade education. Applicants also must be able to write legibly to complete required forms, and must be able to deal tactfully and courteously with all types of people. Because of automobile insurance regulations, a large number of taxicab companies only hire applicants who are at least 21, and in some cases, 25 years of age.

Opportunities for advancement are limited by the small number of supervisory positions. Promotion to the job of dispatcher is often the only possibility. Some drivers, however, have become road supervisors, garage superintendents, or claims agents. A few develop administrative skills and advance to managerial positions in the com-

pany. To increase their income, many drivers buy and operate their own cabs.

Employment Outlook

Opportunities for employment should be good through the mid-1980's. Although little change in the total employment of full-time taxicab drivers is expected, the high turnover of employed drivers should create many jobs.

Many taxicab drivers are temporary employees. Some are working to earn money until they finish school or until they find the job they want; others work to earn money for a special purpose, such as a vacation. After a period of weeks or months, whenever these drivers have obtained other jobs or paid their bills, they quit. As a result, there usually are many taxicab driving jobs available.

Earnings and Working Conditions

Most taxi drivers are paid a percentage—usually between 40 and 50 percent—of the total fare. Drivers also frequently receive tips, ranging from 10 to 20 percent of the fare. In 1974, a private survey reported that drivers averaged $3.25 an hour, including tips. Some taxi drivers covered by union-employer contracts have guaranteed minimums up to $85 a week.

Many drivers rent their cabs from the company by the day for a set fee. Any receipts above the cab rental and other operating expenses are kept by the drivers.

Many full-time drivers start work between 6 a.m. and 8 a.m. to be available for passengers going to work and quit after the evening rush of passengers returning home. During the day they may rest for several hours. Other drivers work nights, starting between 3 p.m. and 5 p.m., and some work on Saturdays, Sundays, and holidays. Drivers do not receive overtime pay.

Sources of Additional Information

For further information on job opportunities in this field, contact local cab companies or the local office of the State employment service.

SCIENTIFIC AND TECHNICAL OCCUPATIONS

Progress in every facet of American life depends to some degree on our scientific and technical work force. An increased standard of living, greater defense capabilities, exploration of outer space, and advancement in atomic energy, health, and communications are just some of the results of the work done by scientists, engineers, and technicians.

About 2.5 million people or nearly one-quarter of all professional workers were engineers, scientists, or other scientific and technical workers in 1974. (See chart 16.) Employment in these occupations increased much more rapidly than did total employment over the past 25 years; the number of scientists and engineers, for example, almost tripled, while the total number of workers in the United States grew by less than half. The growth of our scientific and technical work force resulted from many factors, including overall economic growth, increased research and development (R&D) expenditures; growth of college and university faculties; the race to put a man on the moon; and the development of sophisticated defense systems. Many technological innovations, such as the widespread use of computers, also contributed to this growth.

Engineers

Engineers play a prominent role in bringing scientific progress into our everyday lives. They convert raw materials and sources of power into useful products by applying basic scientific principles. Most engineers work in private industry—primarily industries manufacturing machinery, electrical equipment, and aircraft, and firms providing engineering and architectural services.

Engineers usually specialize in one of several branches. Electrical and mechanical engineering are the largest branches. Many engineers further specialize within an industry such as motor vehicles.

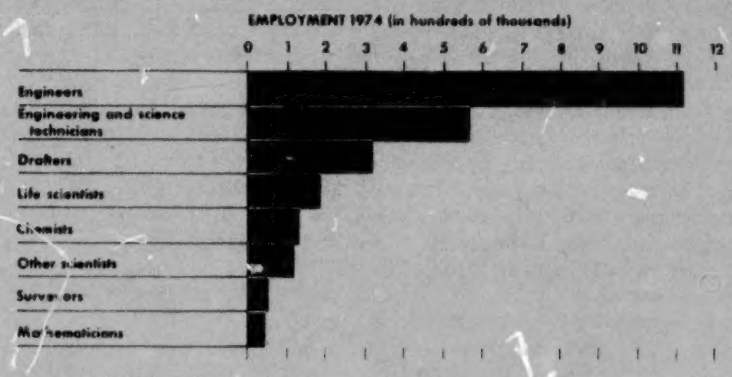
Engineers design, develop, and test equipment; work in the production departments of manufacturing firms; and sell technical products and provide technical assistance to customers. Some are in supervisory and management jobs in which knowledge of engineering is required.

Scientists

Scientists seek knowledge of nature and the physical world through observation, study, and experimentation. The largest group of natural scientists study the laws of the physical world; this group includes chemists, physicists, and environmental scientists. More than half of all physical scientists are chemists. Most work in private industry; about one-third are in chemical manufacturing. A quarter of all physical scientists are physicists. Most work in colleges and universities, teaching and doing research, and in private industry—mostly in companies manufacturing aerospace and defense-related products.

Environmental scientists study the earth, its oceans, and its atmosphere. Their work results in an increased understanding of our planet and has important implications in controlling pollution, discovering and developing natural resources, and weather prediction. This group includes geologists, geophysicists, meteorologists, and

About 2.5 Million Persons are in Scientific and Technical Occupations **16**



Source: Bureau of Labor Statistics

oceanographers. The largest occupation is geologists. Most geologists work in petroleum extraction industries and in colleges and universities, teaching and doing research.

Life scientists study life processes and living organisms, from the largest animals to the smallest microbes. The majority teach or do research in colleges and universities. Biological scientists are tne largest group of life scientists. Medical scientists has been the fastest growing group over the past two decades.

Some mathematicians devote all their time to theoretical research, while others apply mathematical principles to practical problems. Both mathematicians and statisticians work to quantify solutions to problems in science, management, and engineering.

Statisticians collect, analyze, and interpret the numerical results of surveys, quality control tests, or economic and business research programs. In doing so, they assist managers and administrators in making decisions.

Other Scientific and Technical Personnel

More than 900,000 workers in other scientific and technical occupations assist scientists and engineers. These persons work as engineering and science technicians, broadcast technicians, drafters, and surveyors.

Engineering and science technician jobs are more practical and limited in scope than those of engineers and scientists. The more highly skilled jobs, however, require the ability to analyze and solve engineering and science problems and to prepare reports on tests and experiments.

Technicians in research and development set up complex laboratory equipment and help design scientific instruments. In production, they help test and inspect products and act as a liaison between engineering and production departments. Others sell technical products, install complex equipment, and provide technical services to customers.

Broadcast technicians ensure the technical quality of radio and television broadcasts by operating and maintaining sound recorders, television cameras, video tape recorders, and other electronic equipment.

Drafters prepare detailed drawings which show dimensions, material requirements, and other specifications for engineers, architects, and designers.

Surveyors measure construction sites, establish official land boundaries, assist in setting land valuations, and collect information for maps and charts.

Training

A bachelor's degree is usually needed to enter scientific and engineering jobs. However, increasing emphasis is being placed on advanced degrees in some fields, especially in mathematics, physics, and the life sciences. For some occupations, such as astronomers, a doctorate is required for full professional status. A bachelor's degree is sufficient for entry into most engineering jobs, however, and some senior engineering technicians with less than a bachelor's degree are promoted to engineering jobs.

Undergraduate training for scientists and engineers includes courses in their major field and in related science areas, including mathematics. Courses in statistics and computer programming are becoming more important. Students are usually required to take courses in English and a foreign language, as well.

In graduate school, students usually take several courses in their major area of study. Requirements for the master's or doctor's degree vary by institution, but usually include a thesis based on independent research. Students who want to specialize in a particular area of study should select their schools carefully. For example, those who plan to become biomedical engineers and biochemists and work in medicine should study at a university affiliated with a hospital. Those who want to be agricultural scientists can get the most practical training at State universities that have agricultural experiment stations.

Technicians acquire training in many ways. Some complete on-the-job training programs, take formal courses part time while working, or obtain training in the Armed Forces. Many employers, however, seek graduates of specialized training programs. One- to four-year training programs are offered in post-secondary schools—technical institutes, junior and community colleges, area vocational technical schools, and colleges and universities.

Outlook

Opportunities in scientific and technical occupations are expected to expand through the mid-1980's, based on the assumption that additional numbers of engineers, scientists, and technicians will be needed to carry out research and development (R&D) work. In the past, growth in these occupations has been related to increased R&D expenditures, especially by the Federal Government. R&D expenditures of government and industry are expected to continue to increase through the mid-1980's, although more slowly than during the 1960's. If actual R&D levels and patterns differ significantly from those assumed, the outlook in many occupations would be altered.

Scientists, engineers, and other scientific and technical workers will be needed to develop new technologies and better products. In addition, many technically

trained people will be required to solve urgent problems such as air, water, and noise pollution, to develop new sources of energy, and to combat disease.

The following sections of the *Handbook* provide detailed information for 4 conservation occupations, 12 engineering specialties, 13 scientific occupations including life, physical, environmental, and mathematical scientists, and 4 related scientific and technical occupations.

CONSERVATION OCCUPATIONS

Forests, rangelands, wildlife, soil, and water are important natural resources. Conservationists protect, develop, and manage these resources to assure that future needs will be met.

A young person interested in a career in conservation must have specialized training or experience. Foresters, range managers, and soil conservationists generally need bachelor's degrees in their fields. Technical school or on-the-job training is usually required for positions as forestry technicians. In addition to technical knowledge and skills, conservationists must have a sincere interest in the environment and the desire to protect it. They should enjoy dealing with others and like public service, since they often work with people in the community. Flexibility is also important, since a conservationist may work in a remote camping area one week, speak to a community group the next, and fight a forest or brush fire the next.

This section describes four conservation occupations—forester, forestry technician, range manager, and soil conservationist.

FORESTERS

(D.O.T. 040.081)

Nature of the Work

Forests are a vital resource. They can be used repeatedly without being destroyed—if properly managed. The condition of our environment has become a major national concern, and foresters play an important role in protecting that environment by ensuring that our forests are properly used. They manage, develop, and protect these lands and their resources—timber, water, wildlife, forage, and recreational areas.

Foresters also do research, provide forestry information to forest owners and to the general public (called extension work), and teach at colleges and universities.

Foresters often specialize in one area of work, such as timber management, outdoor recreation, or forest economics. Some of these areas are recognized as distinct professions.

Places of Employment

About 24,000 persons—most of them men—worked as foresters in 1974. Over one-third worked in private industry, mainly for pulp and paper, lumber, logging, and milling companies. About one-fourth worked for the Federal Government, primarily in the Forest Service of the Department of Agriculture. The remainder worked for State and local governments, colleges and universities, or consulting firms or were self-employed, either as consultants or forest owners.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in forestry is the minimum educational requirement for those desiring professional careers in forestry. An advanced degree is usually required for teaching and research positions.

Education in forestry leading to a bachelor's or higher degree was offered in 1974 by 51 colleges and universities, of which 40 were accredited by the Society of American Foresters. Curriculums stress the liberal arts and communications skills as well as technical forestry subjects. Most programs also include courses in forest economics and business administration to supplement the student's scientific and technical knowledge. Many colleges require students to spend one summer in a field camp operated by the college. All schools encourage summer jobs that give firsthand experience in forest or conservation work.

Forestry graduates often work under the supervision of experienced foresters before advancing to more responsible positions in forest management or research.

In addition to meeting the intellectual demands of forestry work, foresters must have enthusiasm for outdoor work and be physically hardy.

Employment Outlook

As in the past, employment requirements for foresters are expected to grow about as fast as the average for all occupations through the mid-1980's. In recent years, however, the number of degrees in forestry has exceeded occupational requirements, creating competition for jobs. If the number of degrees granted each year remains at present levels, competition is expected to persist throughout the period. Opportunities will be better for those who can offer an employer either an advanced degree or several years' experience.

The country will need more foresters in the future to ensure an increasing output of forest products. Employment also may increase as we become more aware of the need to conserve and replenish our forest resources, and to improve the environmental quality of our forest lands.

Private owners of timberland may well employ more foresters as they recognize the need for—and

Forester instructs forest crew in core sampling procedure.

the higher profitability of—improved forestry and logging practices. The forest products industry will require additional foresters to apply new techniques for using the entire forest crop, to develop methods of growing superior trees in a shorter period of time, and to do research in the fields of plant genetics and fertilization.

Employment of foresters will probably continue to grow faster in private industry than in the Federal Government where budget limitations may restrain growth. State government agencies will probably hire more foresters through Federal-State cooperative programs for fire control, protection against insects and disease, recreation, and technical assistance to owners of forest lands.

The expected rapid increase in the employment of forest technicians will reduce the amount of time spent by professional foresters in performing routine tasks, but the forester will have to devote more and more time to supervisory work and to the general management of the forest.

Earnings and Working Conditions

Foresters starting in private industry in 1974 earned about $9,500 per year, while the median annual salary in private industry was over $16,000.

Graduates entering the Federal Government as foresters in 1974 with just a bachelor's degree started at $8,500 a year. However, because of keen competition, most foresters hired by the Federal Government either held a master's degree or had some experience, and generally started at $10,500 a year. Ph. D.'s generally started at $12,841 or $15,481 a year. The median annual salary in 1974 for federally employed foresters exceeded $18,000.

In local government, foresters generally began at about $9,200 a year, while their median annual salary was $13,750. State governments paid about $8,600 annually to start, and State median salaries were $13,200 per year. College professors generally started at about $9,300 annually, while their median salary was over $18,000 per year. Many faculty foresters supplement their regular salaries with income from lecturing, consulting, and writing.

The forester—especially in beginning jobs—spends considerable time outdoors in all kinds of weather, sometimes in remote areas. Foresters may also work extra hours on emergency duty, as in firefighting or search and rescue missions.

Sources of Additional Information

General information about the forestry profession, lists of reading materials, and lists of schools offering education in forestry are available from:

Society of American Foresters, 1010 16th St. NW., Washington, D.C. 20036.

National Forest Products Association, 1619 Massachusetts Ave., NW., Washington, D.C. 20036.

General career information is also available from:

American Forest Institute, 1619 Massachusetts Ave. NW., Washington, D.C. 20036.

American Forestry Association, 1319 18th St. NW., Washington, D.C. 20036.

For information on forestry careers in the Forest Service, contact:

U.S. Department of Agriculture, Forest Service, Washington, D.C. 20250.

FORESTRY TECHNICIANS

(D.O.T. 441.137 through 441.887)

Nature of the Work

Forestry technicians, sometimes called forestry aides in entry level positions, assist professional foresters in the care and management of forest lands and their resources. (See statement on Foresters earlier in this chapter.)

Forestry technicians help estimate present and potential timber production in a certain area and measure logs to determine how much lumber they will yield. If new roads are needed to make the timber accessible for cutting, aides may work as part of road building or surveying crews.

Technicians inspect trees for diseases and other problems, and keep records of their findings. On simple watershed improvement projects, they install, maintain, and collect records from rain gauges, streamflow recorders, and instruments that measure soil moisture.

Forestry technicians also help to prevent and control fires. They give fire prevention information to people using the forest and lead firefighting crews if a fire occurs. After fires are extinguished, they take inventory of burned areas and supervise the planting of new trees and shrubs to restore the forest.

Some technicians supervise timber sales and roadbuilding crews or determine recreation-area use. Others work on research projects which make use of their practical skills and experience. Technicians also explain forest regulations and policies to those using the forest and enforce these rules.

Places of Employment

About 10,500 persons worked year round as forestry technicians in 1974. About the same number found temporary employment—primarily with Federal and State Governments—during the summer or in the spring and fall fire seasons.

Nearly half the year-round total worked in private industry, mainly for logging, lumber and paper companies. Reforestation projects of mining, oil and railroad companies—as well as employment in tree nurseries—accounted for the remainder of the industrial total. The Federal Government employed about 3,500 year-round, primarily in the Forest Service of the U.S. Department of Agriculture, while another 2,200 worked for State governments.

Training, Other Qualifications, and Advancement

Young persons qualify for beginning jobs as forestry aides or technicians by completing a specialized course of study in a 1- or 2-year post secondary school, or through work experience. Those who qualify through work experience often begin as forestry aides. After sufficient experience on firefighting crews, in tree nurseries and in recreation work, an aide may qualify for a technician position. Because of keen job competition at the present time, opportunities for employment are better for those with post-secondary school training. In 1974, about 80 technical institutes, junior or community colleges, and universities offered forest technician training, of which 53 are recognized by the Society of American Foresters.

Specialized courses include land surveying, tree identifications, and aerial photograph interpretation. To gain experience, students often spend time working in a forest or camp operated by the school.

Enthusiasm for outdoor work, physical stamina, and the ability to

Forest technicians check plans for a road building project.

carry out tasks without direct supervision are essential for success in this field. The technician should be able to work with survey crews, users of the forest lands, forest owners, and professional foresters.

Well-trained technicians need to understand the basic principles of mathematics and science. They must express their ideas clearly when talking to others and when making written reports.

Forest technicians generally begin work as trainees or in relatively routine positions under the direct supervision of an experienced technician, scientist, or professional forester. As they gain experience, they are given more responsibility, and often move into supervisory positions.

Employment Outlook

Growth in employment of forestry technicians is expected to be faster than the average for all occupations through the mid-1980's. Private industry is expected to provide a higher proportion of these jobs than in the past. However, because so many young people seek to enter the forestry occupations, even those with specialized post-high school training may face competition for existing jobs.

Environmental concern, a rising demand for forest products and increased use of technology in the forest industry are expected to stimulate demand for more technicians each year. Trained technicians will be required to operate specialized and efficient laborsaving machines and to help apply sophisticated scientific methods to forest management. Technicians will also increasingly perform many of the more routine jobs done by foresters.

Earnings and Working Conditions

Annual earnings of forestry aides and technicians range from about $5,000 to almost $16,000; those having high earnings usually have had many years of experience. In the Federal Government, beginning forestry technicians earned $7,596 or $8,500 a year in 1974 depending on education and experience. Beginning salaries in private industry averaged around $8,400 a year.

Forestry technicians spend considerable time outdoors in all kinds of weather, sometimes in remote areas. In emergencies, such as fighting fires and controlling floods, forestry technicians work many extra hours. Climatic conditions often limit year-round field work, and firefighting jobs are limited to the fire season.

Sources of Additional Information

Information about a career in the Federal Government as a forestry technician is available from:

U.S. Department of Agriculture, Forest Service, Washington, D.C. 20250.

For a list of schools recognized by the Society of American Foresters offering training in the field write to:

Society of American Foresters, 1010 16th St. NW., Washington, D.C. 20036.

RANGE MANAGERS

(D.O.T. 040.081)

Nature of Work

Rangelands cover more than 1 billion acres of the United States, mostly in the Western States and Alaska. They contain many natural resources: grass and shrubs for animal grazing, habitats for livestock and wildlife, vast watersheds, facilities for water sports and other kinds of recreation, valuable minerals and energy resources, and areas for scientific study of the environment. These resources can yield their full potential only if properly managed.

Range managers, sometimes called *range conservationists, range scientists*, or *range ecologists*, manage, improve, and protect range resources. They determine the number and kind of animals to be grazed, the grazing system to be used, and the best season for grazing in order to yield a high production of livestock. At the same time, they must conserve soil and vegetation for other uses such as wildlife grazing, outdoor recreation, and timber production. Range managers restore or improve rangelands through techniques such as controlled burning, reseeding, and the biological, chemical, or mechanical control of undesirable plants. For example, rangelands with natural sagebrush vegetation may be plowed up and reseeded with a more productive grass. They also determine and carry out range conservation and development needs such as providing for animal watering facilities, erosion control, and fire prevention.

Because of the multiple use of rangelands, range managers often work in such closely related fields as wildlife and watershed management, forest management, and recreation. Some also work on the ecological restoration of areas formerly devoted to mineral extraction. Some range managers teach, conduct research in range management and improvement, and give technical assistance to holders of privately owned grazing lands.

Places of Employment

About 2,500 persons worked as range managers in 1974. Additional numbers were involved in jobs closely allied to range management. The majority worked for Federal, State, and local government agencies. In the Federal Government, most worked in the Forest Service and the Soil Conservation Service of the Department of Agriculture and the Bureau of Land Management of the Department of the Interior. Range managers in State governments are employed in game

and fish departments, State land agencies, and extension services.

An increasing number of range managers are working with coal and oil companies to help restore an ecological balance to mined out areas. Some range managers are employed by private ranches, while others work as appraisers for banks and real estate firms.

A few range managers teach and do research at colleges and universities. Others work overseas with United States and United Nations agencies and with foreign governments.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in range management or range conservation is the usual minimum educational requirement for range managers. In the Federal Government, a degree in a closely related field, such as agronomy or forestry, including courses in range management and range conservation, may also be accepted. Graduate degrees are generally required for teaching and research, and may be helpful for advancement in other jobs.

In 1974, 34 colleges and universities belonged to the Range Science Education Council. About half these schools offered full programs leading to degrees in range management or range science. The rest generally offered supplementary range science courses.

A degree in range management requires a basic knowledge of biology, chemistry, physics, mathematics, and communication skills. Specialized courses combine plant, animal, and soil sciences with principles of ecology and resource management. Desirable electives include economics, computer science, forestry, wildlife, and recreation.

Federal Government agencies, primarily the Forest Service, the Soil Conservation Service, and the Bureau of Land Management, hire some college juniors and seniors for summer jobs in range management. This experience may help them qualify for jobs when they graduate.

Besides having a love for the outdoors, range managers should be able to write and speak effectively and work with others.

Range manager reviews grazing permit with rancher.

Employment Outlook

Employment opportunities for range managers are expected to be good through the mid-1980's. Increasing pressures for an abundant supply of meat and other rangeland animal products should stimulate demand for range managers. Since the amount of rangeland is generally fixed, range managers will be needed to increase the output of rangelands while protecting their ecological balance.

As oil and coal exploration accelerates, and with the exploitation of oil shale fields, private industry will probably require many more range specialists to rehabilitate ecologically disturbed areas.

The use of rangelands for other purposes such as wildlife protection and recreation could create additional needs for range managers. Federal hiring, however, depends heavily upon legislation designed to protect, control, and manage range resources.

Earnings and Working Conditions

In the Federal Government, range managers with the bachelor's degree start at either $8,500 or $10,520, depending on their college grades. Those having 1 or 2 years of graduate work begin at

$10,520 or $12,841; persons with Ph. D. degrees start at either $15,481 or $18,463 a year.

Starting salaries for range managers who work for State governments are about the same as those paid by the Federal Government and private corporations. According to limited data, those who work on private ranches earn somewhat lower salaries than persons who work for government agencies. In colleges and universities, Ph. D.'s generally start around $14,000 a year. Range managers in educational institutions sometimes supplement their regular salaries with income from part-time consulting and lecturing and from writing books and articles.

Range managers may spend considerable time away from home working outdoors in remote parts of the range.

Sources of Additional Information

Information about a career as a range manager as well as a list of schools offering training is available from:

Society for Range Management, 2120 S. Birch St., Denver, Colo. 80222.

For information about career opportunities in the Federal Government, contact:

Bureau of Land Management, Denver Service Center, Federal Center Building 50, Denver, Col. 80255.

Forest Service, U.S. Department of Agriculture, 1621 N. Kent St., Arlington, Va. 20415.

Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C. 20250.

SOIL CONSERVATIONISTS

(D.O.T. 040.081)

Nature of the Work

Soil conservationists provide farmers, ranchers, and others with technical assistance in the conservation of soil and water. Farmers and other land managers use this technical assistance in adjusting land use, protecting land against soil deterioration, rebuilding eroded and depleted soils, and stabilizing runoff and sediment-producing areas. They also help improve cover on lands devoted to raising crops, and maintaining forest, pasture, and range land and the wildlife these lands support. They help plan water handling, conserving water for farm and ranch use, reducing damage from flood water and sediment, and draining or irrigating farms or ranches as needed.

The types of technical services provided by soil conservationists are many. They prepare maps which present inventories of soil, water, vegetation, and other details essential in conservation planning and application. They develop information concerning proper methods of land utilization depending on the planned use of the land, for areas varying from field or partial farm or ranch through groups of farms or ranches to entire watersheds. They help estimate relative costs and expected returns of various alternatives of land use and treatment.

After the landowner or operator decides which conservation program to use, the conservationist records the relevant facts as part of a plan. This, together with the maps and other supplemental information, constitutes a plan of action for conservation farming or ranching. The soil conservationist then gives the land manager technical guidance in applying and maintaining these conservation practices.

Where Employed

An estimated 8,500 soil conservationists were employed in 1974, mostly by the Federal Government in the U.S. Department of Agriculture's Soil Conservation Service and the Department of the Interior's Bureau of Indian Affairs. Some are employed by colleges and State and local governments, and others by banks and public utilities.

Training and Advancement

A bachelor of science degree with a major in soil conservation or one of the closely related agricultural or natural resource sciences, such as agronomy, forestry, wildlife biology, regional planning, agricultural education, or agricultural engineering. Study must include 30-semester hours or the equivalent in natural resources or agricultural fields, including the equivalent of 3-semester hours in soils.

Employment Outlook

Employment opportunities for well-trained soil conservationists are good. Opportunities in the profession will expand because public utility companies, banks, and other organizations are becoming interested in conservation and are adding conservationists to their staffs. Some new openings will occur in college teaching at the undergraduate level. In addition, some openings will result because of the normal turnover in personnel.

Earnings

Soil conservationists having a bachelor's degree and employed by the Federal Government received $8,500 a year in late 1974. Advancement to $10,520 could be expected after 1 year of satisfactory service. Further advancement depends upon the individual's ability to accept greater responsibility. Earnings of well-qualified Federal soil conservationists with several years' experience range from $15,481 to $25,581 a year.

Sources of Additional Information

Additional information on employment as a soil conservationist

may be obtained from the U.S. Civil Service Commission, Washington, D.C. 20415; Employment Division, Office of Personnel, U.S. Department of Agriculture, Washington, D.C. 20250; or any office of the Department's Soil Conservation Service.

ENGINEERS

The work of engineers affects our lives in thousands of different ways. Their past accomplishments have enabled us to drive safer automobiles, reach the moon, and even prolong life through special machinery. Future accomplishments could help us obtain energy self-sufficiency, develop more pollution-free powerplants and aid medical science's fight against disease.

In 1974, more than 1.1 million persons were employed as engineers, the second largest professional occupation exceeded only by teachers. About 1 percent of all engineers were women. The number of women engineers is expected to increase in the future, since enrollments of women in engineering programs have increased sharply over the past several years.

Most engineers specialize in one of the more than 25 specialties recognized by professional societies. Within the major branches are over 85 subdivisions. Structural, environmental, hydraulic, and highway engineering, for example, are subdivisions of civil engineering. Engineers may also specialize in the engineering problems of one industry, such as motor vehicles, or in a particular field of technology, such as propulsion or guidance systems. Since knowledge of basic engineering principles is required for all areas of engineering, it is possible for engineers to shift from one branch or field of specialization to another, especially during the early stages of their careers. This section, which contains an overall discussion of engineering, is followed by separate statements on 12 branches of the profession—aerospace, agricultural, biomedical, ceramic, chemical, civil, electrical, industrial, mechanical, metallurgical, mining, and petroleum engineering.

Nature of the Work

Engineers develop electric power, water supply, and waste disposal systems to meet the problems of urban living. They design machines and artificial organs which save countless numbers of lives. They design industrial machinery and equipment used to manufacture goods; and heating, air-conditioning, and ventilation equipment for more comfortable living. Engineers also develop scientific equipment to probe outer space and the ocean depths, and design, plan, and supervise the construction of buildings, highways, and rapid transit systems. They design and develop consumer products such as automobiles, television sets, and refrigerators, and systems for control and automation of manufacturing, business, and management processes.

Engineers must consider many factors in developing a new product. For example, in developing new devices to reduce automobile exhaust emissions, engineers must determine the general nature of the device, calculate and test all components, and fit them together in an integrated plan. They must then evaluate the overall effectiveness of the new device, as well as its cost and reliability. These factors are applicable to most products, including those as different as artificial hearts, electronic computers, or industrial machinery.

In addition to design and development, engineers work in testing, production, or operation and maintenance. Still others are in administrative and management jobs where an engineering background is necessary, or in sales where they discuss the technical aspects of a product and assist in planning its installation or use. (See statement on Manufacturers' Salesworkers elsewhere in the *Handbook*.) Engineers with considerable experience sometimes work as consultants or teach in the engineering schools of colleges and universities.

Engineers within each of the branches may apply their specialized knowledge to many fields. Electrical engineers, for example, work in medicine, computers, missile guidance, or electric power distribution. Because engineering problems are usually complex, the work in some fields cuts across the traditional branches. Using a team approach to solve problems, engineers in one field often work closely with specialists in other scientific, engineering, and business occupations.

Places of Employment

More than half of all engineers work in manufacturing industries—mostly in the electrical equipment, aircraft and parts, machinery, chemicals, scientific instruments, primary metals, fabricated metal products, and motor vehicle industries. Over 330,000 were employed in nonmanufacturing industries in 1974, primarily in construction, public utilities, engineering and architectural services, and business and management consulting services.

Federal, State, and local governments employed more than 150,000 engineers. Over half worked for the Federal Government, mainly in the Departments of Defense, Interior, Agriculture, Transportation, and in the National Aeronautics and Space Administration. Most engineers in State and

local government agencies worked in highway and public works departments.

Colleges and universities employed about 43,000 engineers in research and teaching jobs, and a small number worked for nonprofit research organizations.

Engineers are employed in every State, in small and large cities and in rural areas. However, about two-thirds of all engineers in private industry are employed in 10 States, and of these almost one-third are in California, New York, and Pennsylvania. Some branches of engineering are concentrated in particular industries, as discussed in the statements later in this chapter.

Training, Other Qualifications, and Advancement

A bachelor's degree in engineering is the generally accepted educational requirement for beginning engineering jobs. College graduates trained in one of the natural sciences or mathematics also may qualify for some beginning jobs. Experienced technicians with some engineering education are sometimes able to advance to engineering jobs.

Graduate training is being emphasized for an increasing number of jobs; it is essential for most beginning teaching and research positions, and desirable for advancement. Some specialties, such as nuclear engineering, are taught mainly at the graduate level.

About 280 colleges and universities offer a bachelor's degree in engineering. Although programs in the larger branches of engineering are offered in most of these institutions, some small specialties are taught in only a very few. Therefore, students desiring specialized training should investigate curriculums before selecting a college. Admissions requirements for undergraduate engineering schools usually include high school courses in advanced mathematics and the physical sciences.

In a typical 4-year curriculum, the first 2 years are spent studying basic sciences—mathematics, physics, chemistry, introductory engineering—and the humanities, social sciences, and English. The last 2 years are devoted, for the most part, to specialized engineering courses. Some programs offer a general engineering curriculum, permitting the student to choose a specialty in graduate school or acquire it on the job.

Some engineering curriculums require more than 4 years to complete. A number of colleges and universities now offer 5-year master's degree programs. In addition, several engineering schools have formal arrangements with liberal arts colleges whereby a student spends 3 years in liberal arts and 2 years in engineering and receives a bachelor's degree from each.

Some schools have 5- or even 6-year cooperative plans where students coordinate classroom study and practical work experience. In addition to gaining useful experience, students can finance part of their education. Because of the need to keep up with rapid advances in technology, engineers often continue their education throughout their careers in programs sponsored by employers, or in colleges and universities after working hours.

All 50 States and the District of Columbia require licensing for engineers whose work may affect life, health, or property, or who offer their services to the public. In 1974, about 350,000 engineers were registered. Generally, registration requirements include a degree from an accredited engineering school, 4 years of relevant work experience, and the passing of a State examination.

Engineering graduates usually begin work under the supervision of experienced engineers. Many companies have special programs to acquaint new engineers with special industrial practices and to determine the specialties for which they are best suited. Experienced engineers may advance to positions of greater responsibility; those with proven ability often become administrators and increasingly larger numbers are being promoted to top executive jobs. Some engineers obtain graduate degrees in business administration to improve their advancement opportunities, while still others obtain law degrees and become patent attorneys.

Engineers should be able to work as part of a team and have creativity, an analytical mind, and a capacity for detail. They should be able to express their ideas well orally and in writing.

Employment Outlook

Employment opportunities for engineers are expected to be good through the mid-1980's. Opportunities for recent graduates of engineering schools are expected to be very good since the number of new graduates is expected to fall short of the number needed to fill the thousands of openings created by employment growth, and the need to replace those who die, retire, or transfer to other occupations. Because of the expected shortage, many openings will be filled by upgraded technicians and college graduates from related fields.

Employment requirements for engineers are expected to grow faster than the average for all occupations through the mid-1980's. Much of this growth will stem from industrial expansion to meet the demand for more goods and services. More engineers will be needed in the design and construction of factories, electric powerplants, office buildings, and transportation systems, as well as in the development and manufacture of more advanced computers, scientific instru-

ments, industrial machinery, chemical products, and motor vehicles.

Many engineers will be required in energy-related activities developing new sources of energy as well as designing energy-saving systems for automobiles, homes, and other buildings. Engineers also will be needed to solve environmental pollution problems.

Defense spending will also affect the outlook for engineers, since a large number work in defense-related activities. The long-range outlook for engineers given here is based on the assumption that defense spending will increase from its 1974 level by the mid-1980's, but will still be somewhat lower than the peak levels of the 1960's. If, however, defense activity differs substantially from the level assumed, the demand for engineers will differ from that now expected.

Since so many factors affect overall employment requirements, opportunities for engineers fluctuate periodically. In the short run, the available engineering jobs can either exceed or fall short of the number of persons looking for jobs, but over the long run, engineers can look forward to good job opportunities.

(The outlook for various branches is discussed in the separate statements later in this section.)

Earnings and Working Conditions

New engineering graduates with a bachelor's degree and no experience were offered average starting salaries of $11,940 a year in private industry in 1974, according to the College Placement Council. Master's degree graduates with no experience averaged almost $13,700 a year; Ph. D. graduates averaged about $18,000. Starting offers for those with the bachelor's degree vary by branch as shown in the accompanying table.

Starting salaries for engineers, by branch, 1973–74

Branch	Average starting salaries
Aeronautical engineering	$11,500
Chemical engineering	12,500
Civil engineering	11,600
Electrical engineering	11,800
Industrial engineering	11,700
Mechanical engineering	12,000
Metallurgical engineering	12,000

In the Federal Government in late 1974, engineers with a bachelor's degree and no experience could start at $8,500 or $10,520 a year, depending on their college records. Those with a master's degree could start at $10,520 or $12,841. Those having a Ph. D. degree could begin at $15,481 or $18,463. The average salary for experienced engineers in the Federal Government varied by engineering branch, ranging from $20,300 for agricultural engineers to $26,900 for nuclear engineers.

In colleges and universities in 1974, engineers started at about $10,550 a year as instructors, or $13,050 a year as assistant professors for a 9- or 10- month academic year. (See statement on College and University Teachers elsewhere in the *Handbook*.)

Engineers can expect an increase in earnings as they gain experience. According to an Engineering Manpower Commission Survey, the average salary for engineers with 21 to 23 years of experience was $22,900 in 1974. Some in top-level executive positions had much higher earnings.

Many engineers work under quiet conditions in modern offices and research laboratories. Others, however, spend time in more active work—in a factory or mine, at a construction site, or some other outdoor location.

Sources of Additional Information

General information on engineering careers—including student selection and guidance, professional training, and salaries—is available from:

Engineers' Council for Professional Development, 345 E. 47th St., New York, N.Y. 10017.

Engineering Manpower Commission, Engineers Joint Council, 345 E. 47th St., New York. 10017.

National Society of Professional Engineers, 2029 K St. NW., Washington, D.C. 20006.

Information on registration of engineers may be obtained from:

National Council of Engineering Examiners, P.O. Box 752, Clemson, S.C. 29613.

For information about graduate study, contact:

American Society for Engineering Education, One Dupont Circle, Suite 400, Washington, D.C. 20036.

Societies representing the individual branches of the engineering profession are listed later in this chapter. Each can provide information about careers in the particular branch. Many other engineering organizations are listed in the following publications available in most libraries or from the publisher:

Directory of Engineering Societies, published by Engineers Joint Council, 345 E. 47th St., New York, N.Y. 10017.

Scientific and Technical Societies of the United States and Canada, published by the National Academy of Sciences, National Research Council.

Some engineers are members of labor unions. Information on engineering unions is available from:

International Federation of Professional and Technical Engineers, 1126 16th St. NW., Washington, D.C. 20036.

AEROSPACE ENGINEERS

(D.O.T. 002.081)

Nature of the Work

Aerospace engineers play a vital role in America's defense and space activities. They work on all types of aircraft and spacecraft including missiles, rockets, and military and

commercial planes. They develop aerospace products from initial planning and design to final assembly and testing.

Aerospace engineers generally specialize in an area of work like structural design, navigational guidance and control, instrumentation and communication, or production methods. They also may specialize in one type of aerospace product such as passenger planes, launch vehicles, satellites, manned space capsules, or landing modules.

Places of Employment

About 52,000 aerospace engineers were employed in 1974, mainly in the aircraft and parts industry. Some worked for Federal Government agencies, primarily the National Aeronautics and Space Administration and the Department of Defense. A few worked for commercial airlines, consulting firms, and colleges and universities.

Employment Outlook

Employment of aerospace engineers is expected to rise above recent levels by the mid-1980's. Employment of aerospace engineers is largely determined by the level of Federal expenditures on defense and space programs: in the past, rapid changes in spending levels have usually been accompanied by sharp employment fluctuations. Expenditures for the space program are expected to increase only slightly from 1974 to the mid-1980's, while defense spending will probably increase moderately. Although neither defense nor space expenditures are expected to reach their peak levels of the 1960's, many additional workers will be required to fill openings created by growth of the aerospace industry and by deaths, retirements, and transfers. (See introductory section of this chapter for discussion of training requirements and earnings. See also statement on Aircraft, Missile, and Spacecraft Manufacturing elsewhere in the *Handbook*.)

Sources of Additional Information

American Institute of Aeronautics and Astronautics, Inc., 1290 Avenue of the Americas, New York, N.Y. 10019.

AGRICULTURAL ENGINEERS

(D.O.T. 013.081)

Nature of the Work

Agricultural engineers develop machinery, equipment, and methods to improve efficiency in the production, processing, and distribution of food and other agricultural products. They design farm machinery, equipment, and structures, and develop methods for utilizing electrical energy on farms and in food and feed processing plants. Agricultural engineers also are concerned with the conservation and management of soil and water resources. They work in research and development, production, sales, or management.

Places of Employment

Most of the 12,000 agricultural engineers employed in 1974 worked for manufacturers of farm and household equipment, electric utility companies, and distributors of farm equipment and supplies. Some worked for engineering consultants who supply services to farmers and farm-related industries; others were independent consultants.

The Federal Government employs about 600 agricultural engineers in the Soil Conservation Service and Agricultural Research Service of the Department of Agriculture. Some are employed by colleges and universities, and a few are employed by State and local governments.

Employment Outlook

Employment of agricultural engineers is expected to grow faster than the average for all occupations through the mid-1980's. Increasing demand for agricultural products, modernization of farm operations, increasing emphasis on conservation of resources, and the use of agricultural products and wastes as industrial raw materials should provide opportunities for additional engineers. (See introductory part of this section for information on training requirements and earnings. See also statement on Agriculture elsewhere in the *Handbook*.)

Sources of Additional Information

American Society of Agricultural Engineers, 2950 Niles Rd., St. Joseph, Mich. 49085.

BIOMEDICAL ENGINEERS

Nature of the Work

Biomedical engineers use engineering principles to solve medical and health-related problems. Many do research, along with life scientists, chemists, and members of the medical profession, on the engineering aspects of the biological systems of man and animals. Some design and develop medical instruments and devices including artificial hearts and kidneys, lasers for surgery, and pacemakers that regulate the heartbeat. Other biomedical engineers adapt computers to medical science, and design and build systems to modernize laboratory, hospital, and clinical procedures. Most engineers in this field require a sound background in one of the major engineering disciplines (mechanical, electrical or chemical) in addition to specialized biomedical training.

Places of Employment

There were 3,000 biomedical engineers in 1974. Most teach and do research in colleges and universities. Some work for the Federal Government, primarily in the National Aeronautics and Space Administration, or in State agencies. An increasing number work in private industry developing new devices, techniques, and systems for improving health care. Some work in sales positions.

Employment Outlook

Employment of biomedical engineers is expected to grow faster than the average for all occupations through the mid-1980's, but the actual number of openings is not likely to be very large. Those who have master's and Ph. D. degrees will be in strong demand to teach and to fill jobs resulting from increased expenditures for medical research. Increased research funds could also create new positions in instrumentation and systems for the delivery of health services. (See introductory part of this chapter for information on training requirements and earnings.)

Sources of Additional Information

Alliance for Engineering in Medicine and Biology, 3900 Wisconsin Ave. NW., Suite 300, Washington, D.C. 20016.

Biomedical Engineering Society, P.O. Box 2399, Culver City, Calif. 90230.

Foundation for Medical Technology, Mt. Sinai Medical Center, 100 St., 5th Ave., New York, N.Y. 10029.

CERAMIC ENGINEERS

(D.O.T. 006.081)

Nature of the Work

Ceramic engineers develop methods for processing ceramic materials into useful products. Although to some, the word ceramics means pottery, ceramics actually include a wide range of products with thousands of uses. Ceramics include all non-metallic, inorganic materials which require the use of high temperature in their processing. Thus, ceramic engineers work on diverse products such as glassware, heat-resisting materials for missile nose cones, electronic components and materials used in medical devices, and nuclear reactors. They also design and supervise the construction of plants and equipment to manufacture these products.

Ceramic engineers generally specialize in one or more products—for example, products of refractories (fire-and heat-resistant materials such as firebrick); whitewares (porcelain and china dinnerware or high voltage electrical insulators); structural materials (such as brick tile, and terra cotta); electronic ceramics (ferrites for memory systems and microwave devices); protective and refractory coatings for metals; glass; abrasives; cements technology; or fuel elements for atomic energy.

Places of Employment

About 12,000 ceramic engineers were employed in 1974, mostly in the stone, clay, and glass industries. Others work in industries that produce or use ceramic products such as the iron and steel, electrical equipment, aerospace, and chemicals industries. Some are in colleges and universities, independent research organizations, and the Federal Government.

Employment Outlook

Employment of ceramic engineers is expected to grow faster than the average for all occupations through the mid-1980's.

Programs related to nuclear energy, electronics, defense, and medical science will provide job opportunities for ceramic engineers. Additional ceramic engineers will be required to improve and adapt traditional ceramic products, such as whitewares and abrasives, to new uses. The development of filters and catalytic surfaces to reduce pollution, and the development of ceramic materials for energy conversion and conservation should create additional openings for ceramic engineers. (See introductory part of this section for information on training requirements and earnings.)

Sources of Additional Information

American Ceramic Society, 65 Ceramic Dr., Columbus, Ohio 43214.

CHEMICAL ENGINEERS

(D.O.T. 008.081)

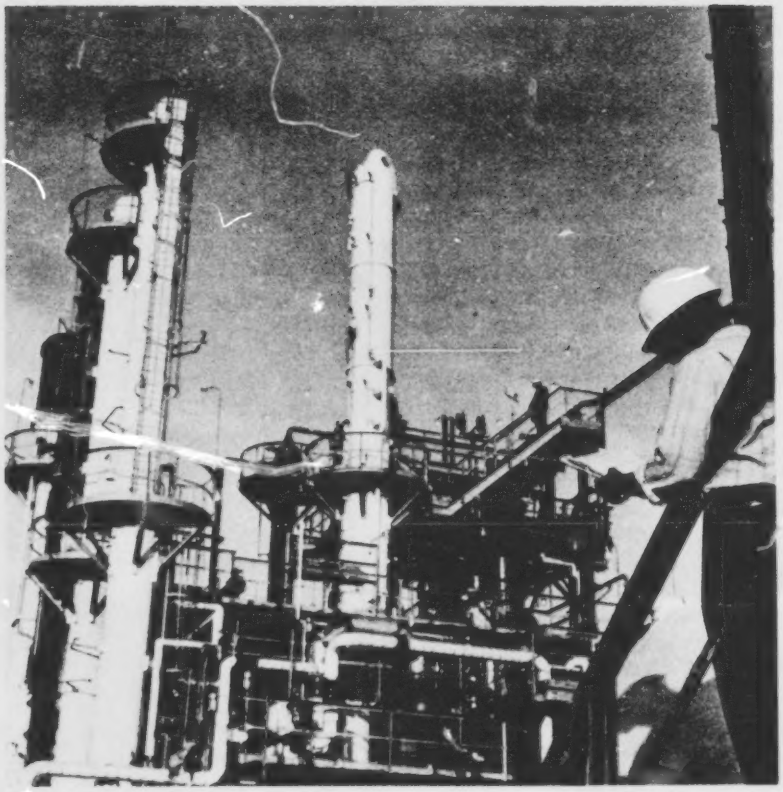
Nature of the Work

Chemical engineers are involved in many phases of the production of chemicals and chemical products. They design equipment and chemical plants as well as determine methods of manufacturing the product. Often, they design and operate pilot plants to test their work and develop chemical processes such as those for removing chemical contaminants from waste materials. Because the duties of chemical engineers cut across many fields, these professionals must have a working knowledge of chemistry, physics, and mechanical and electrical engineering.

This branch of engineering is so diversified and complex that chemical engineers frequently specialize in a particular operation such as oxidation or polymerization. Others specialize in a particular area such as environmental control or in the production of a specific product like plastics or rubber.

Places of Employment

Most of the 50,000 chemical en-



Chemical engineer checks production instructions on chemical plant.

gineers working in 1974 were in manufacturing industries, primarily those producing chemicals, petroleum, and related products. Some worked in government agencies or taught and did research in colleges and universities. A small number worked for independent research institutes and engineering consulting firms, or as independent consulting engineers.

Employment Outlook

Employment of chemical engineers is expected to grow faster than the average for all occupations through the mid-1980's. A major factor underlying this growth is industry expansion—the chemicals industry in particular.

The growing complexity and automation of chemical processes will require additional chemical engineers to design, build, and maintain the necessary plants and equipment. Chemical engineers also will be needed in solving problems of environmental protection, synthetic food processing, and in the design and development of nuclear reactors. In addition, development of new chemicals used in the manufacture of consumer goods, such as plastics and man-made fibers, probably will create additional openings. (See introductory part of this section for information on training requirements and earnings. See also the statement on Chemists and the Industrial Chemical Industry elsewhere in the *Handbook*.)

Sources of Additional Information

American Institute of Chemical Engineers, 345 East 47th St., New York, N.Y. 10017.

CIVIL ENGINEERS

(D.O.T. 005.081)

Nature of the Work

Civil engineering is one of the oldest branches of the profession. Civil engineers design and supervise the construction of roads, harbors, airports, tunnels, bridges, water supply and sewage systems, and buildings. Major specialties within civil engineering are structural, hydraulic, environmental (sanitary), transportation (including highways and railways), geotechnical and soil mechanics.

Many civil engineers are in supervisory or administrative positions ranging from site supervisor of a construction project or city engineer to top-level executive. Others teach in colleges and universities or work as consultants.

Places of Employment

Nearly 170,000 civil engineers were employed in 1974. Most work for Federal, State, and local government agencies or in the construction industry. Many work for consulting engineering and architectural firms or as independent consulting engineers. Others work for public utilities, railroads, educational institutions, and manufacturing industries.

Civil engineers work in all parts of the country, usually in or near major industrial and commercial centers. They often work at construction sites, sometimes in remote areas or in foreign countries. In some jobs, they must often move from place to place to work on different projects.

Civil engineers design a variety of projects such as roads, bridges, and air fields.

Employment Outlook

Employment of civil engineers is expected to increase faster than the average for all occupations through the mid-1980's. Job opportunities will result from the growing needs for housing, industrial buildings, electric power generating plants, and transportation systems created by an increasing population and an expanding economy. Work related to solving problems of environmental pollution and energy self-sufficiency will also require additional civil engineers. Increasing development of offshore drilling facilities will create additional openings for civil engineers in this specialized area.

Many civil engineers also will be needed each year to replace those who retire or die. (See introductory part of this section for information on training requirements and earnings.)

Sources of Additional Information

American Society of Civil Engineers, 345 E. 47th St., New York, N.Y. 10017.

ELECTRICAL ENGINEERS

(D.O.T. 003.081, .151, and .187)

Nature of the Work

Electrical engineers design, develop, and supervise the manufacture of electrical and electronic equipment. These include electric motors and generators; communications equipment; electronic equipment such as heart pacemakers, pollution measuring instrumentation, radar, computers, lasers, and missile guidance systems; and electrical appliances of all kinds. They also design and operate facilities for generating and distributing electric power.

Electrical engineers generally specialize in a major area of work such as electronics, computers, electrical equipment manufacturing, communications, or power. Others specialize in subdivisions of these broad areas like microwaves or missile guidance and tracking systems. Many are engaged in research, development, and design activities. Some are in administrative and management jobs; others work in manufacturing operations, in technical sales, or in college teaching.

Places of Employment

Electrical engineering is the largest branch of the profession. Nearly 290,000 electrical engineers were employed in 1974, mainly by manufacturers of electrical and electronic equipment, aircraft and parts, business machines, and professional and scientific equipment. Many work for telephone, telegraph, and electric light and power companies. Large numbers are employed by government agencies and by colleges and universities. Others work for construction firms, for engineering consultants, or as independent consulting engineers.

Employment Outlook

Employment of electrical engineers is expected to increase faster than the average for all occupations through the mid-1980's. In-

creased demand for products such as computers, communications and electric power generating equipment, and military electronics is expected to be the major factor contributing to this growth. The demand for electrical and electronic consumer goods, along with increased research and development in nuclear power generation, should create additional jobs for electrical engineers. Many electrical engineers also will be needed to replace personnel who retire, die, or transfer to other fields of work.

The long-range outlook for electrical engineers is based on the assumption that defense spending in the mid-1980's will increase from the 1974 level, but will still be somewhat lower than the peak level of the late 1960's. If defense activity should differ substantially from the projected level, the demand for electrical engineers will differ from that now expected.

(See introductory part of this section for information on training requirements and earnings. See also statement on Electronics Manufacturing elsewhere in the *Handbook*.)

Sources of Additional Information

Institute of Electrical and Electronic Engineers, 345 East 47th St., New York, N.Y. 10017.

INDUSTRIAL ENGINEERS

(D.O.T. 012.081, .168, and .188)

Nature of the Work

Industrial engineers determine the most effective ways for an organization to use the basic factors of production—personnel, machines, and materials. They are more concerned with people and methods of business organization, than are engineers in other specialties who generally are concerned more with particular products or processes, such as metals, or power and mechanics.

Industrial engineers design systems for data processing and apply operations research techniques to organizational, production, and related problems. They also develop management control systems to aid in financial planning and cost analysis, design production planning and control systems to coordinate activities and control product quality, and design or improve systems for the physical distribution of goods and services. Other activities include plant location surveys, where they must consider sources of raw materials, transportation, and taxes, and the development of wage and salary administration concepts and job evaluation programs.

Places of Employment

About 180,000 industrial engineers were employed in 1974; more than two-thirds worked in manufacturing industries. Because their skills can be used in almost any type of company, they are more widely distributed among industries than are those in other branches of engineering. For example, some work for insurance companies, banks, construction and mining firms, and public utilities. Hospitals, retail organizations, and other large business firms employ industrial engineers to improve operating efficiency. Still others work for government agencies and colleges and universities. A few are independent consulting engineers.

Industrial engineer reviews film of production process to check for problems.

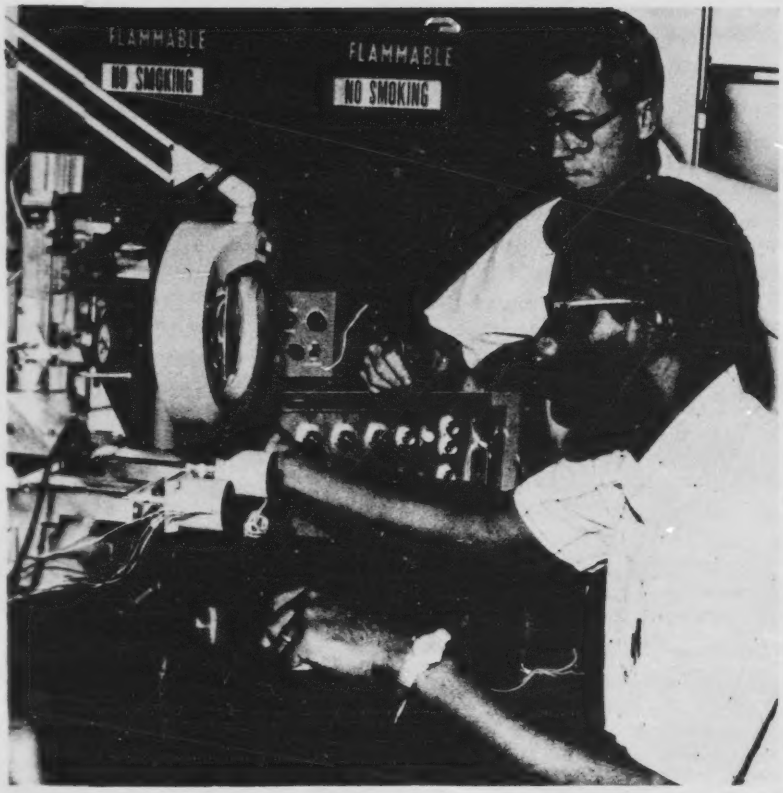
Employment Outlook

Employment of industrial engineers is expected to grow faster than the average for all occupations through the mid-1980's. The increasing complexity of industrial operations and the expansion of automated processes, along with industry growth, are factors contributing to employment growth. Increased recognition of the importance of scientific management and safety engineering in reducing costs and increasing productivity, and the need to solve problems of environmental pollution, should create additional opportunities.

Additional numbers of industrial engineers will be required each year to replace those who retire, die, or transfer to other occupations. (See introductory part of this section for information on training requirements and earnings.)

Sources of Additional Information

American Institute of Industrial Engineers, Inc., 25 Technology Park, Atlanta, Norcross, Ga. 30071



Mechanical engineers test a mockup of equipment.

MECHANICAL ENGINEERS

(D.O.T. 007.081, .151, .168, and .187)

Nature of the Work

Mechanical engineers are concerned with the production, transmission, and use of power. They design and develop machines that produce power, such as internal combustion engines, steam and gas turbines, jet and rocket engines, and nuclear reactors. They also design and develop a great variety of machines that use power—refrigeration and air-conditioning equipment, elevators, machine tools, printing presses, steel rolling mills, and many others.

Many specialized areas of work have developed within this field and, since mechanical engineers are employed in nearly all industries, their work varies with the industry and the function performed. Among these specialties are motor vehicles, marine equipment, steampower, heating, ventilating and air-conditioning, instrumentation, and machines for specialized industries, such as petroleum, rubber and plastics, and construction.

Large numbers of mechanical engineers do research, test, and design work. Many are administrators or managers, while others work in maintenance, technical sales, and production operations. Some teach in colleges and universities or work as consultants.

Places of Employment

About 185,000 mechanical engineers were employed in 1974. Almost three-fourths were employed in manufacturing—mainly in the primary and fabricated metals, machinery, transportation equipment, and electrical equipment industries. Others work for government agencies, educational institutions, and consulting engineering firms.

Employment Outlook

Employment of mechanical engineers is expected to increase faster than the average for all occupations through the mid-1980's. The growing demand for industrial machinery and machine tools and the increasing complexity of industrial machinery and processes will be major factors supporting increased employment opportunities. Growing demand for nuclear

power, as well as the need to solve environmental pollution problems, will also contribute to employment growth.

Large numbers of mechanical engineers also will be required each year to replace those who retire, die, or transfer to other occupations. (See introductory part of this section for information on training requirements and earnings. See also statement on Occupations in the Atomic Energy Field elsewhere in the *Handbook*.)

Sources of Additional Information

The American Society of Mechanical Engineers, 345 E. 47th St., New York, N.Y. 10017.

METALLURGICAL ENGINEERS

(D.O.T. 011.081)

Nature of the Work

Metallurgical engineers, increasingly referred to as materials engineers, develop methods to process and convert metals into useful products. These engineers generally work in one of the three main branches of metallurgy—extractive or chemical, physical, and mechanical. Extractive metallurgists are concerned with extracting metals from ores, and refining and alloying them to obtain useful metal. Physical metallurgists deal with the nature, structure, and physical properties of metals and their alloys, and with methods of converting refined metals into final products. Mechanical metallurgists develop methods to work and shape metals such as casting, forging, rolling, and drawing. Scientists working in this field are known as metallurgists or materials scientists, but the distinction between scientists and engineers is small.

Metallurgical engineers use scientific equipment to study the structural make-up of materials.

Places of Employment

The metalworking industries—primarily the iron and steel and nonferrous metals industries—employed over one-half of the estimated 17,000 metallurical and materials engineers in 1974. Metallurgical engineers also work in industries that manufacture machinery, electrical equipment, and aircraft and parts, and in the mining industry. Some work for government agencies and colleges and universities.

Employment Outlook

Employment of metallurgical and materials engineers is expected to grow about as fast as the average for all occupations through the mid-1980's. An increasing number of these engineers will be needed by the metalworking industries to develop new metals and alloys as well as to adapt current ones to new needs. For example, communications equipment, computers, and spacecraft require lightweight metals of high purity. Metallurgical engineers also will be needed to solve problems associated with the efficient use of nuclear energy. As the supply of high-grade ores diminishes, more metallurgical engineers will be required to develop new ways of recycling solid waste materials in addition to processing low-grade ores now regarded as unprofitable to mine. (See introductory part of this section for information on training requirements and earnings. Also see statement on the Iron and Steel Industry elsewhere in the *Handbook*.)

Sources of Additional Information

The Metallurgical Society of the American Institute of Mining, Metallurgical, and Petroleum Engineers, 345 E. 47th St., New York, N.Y. 10017.

American Society for Metals, Metals Park, Ohio 44073.

MINING ENGINEERS

(D.O.T. 010.081 and .187)

Nature of the Work

Mining engineers find, extract, and prepare minerals for manufacturing industries to use. They design the layouts of mines, supervise the construction of mine shafts and tunnels in underground operations, and devise methods for transporting minerals to processing plants. Mining engineers are responsible for the efficient operation of mines and mine safety, including ventilation, water supply, power, communications, and equipment maintenance. Some mining engineers work with geologists and metallurgical engineers to locate and appraise new ore deposits. Others develop new mining equipment and devise improved methods to process extracted minerals. Mining engineers frequently specialize in the extraction of specific metal ores, coal, and other nonmetallic meinerals.

With increased emphasis on protecting the environment, many mining engineers have been working to solve problems related to mined-land reclamation and water and air pollution.

Places of Employment

About 5,000 mining engineers were employed in 1974. Most work in the mining industry. Some work for firms that produce equipment for the mining industry, while others work in colleges and universities, in government agencies, or as independent consultants.

Mining engineers discuss proper roof control methods with miners.

Mining engineers are usually employed at the location of mineral deposits, often near small communities. However, those in research, teaching, management, consulting, or sales are often located in large metropolitan areas.

Employment Outlook

Employment of mining engineers is expected to increase through the mid-1980's. Efforts to attain energy self-sufficiency should spur the demand for coal, and therefore for mining engineers in the coal industry. The increase in demand for coal will depend, to a great extent, on the availability and price of other domestic energy sources such as petroleum, natural gas, and nuclear energy. More technologically advanced mining systems and further enforcement of mine health and safety regulations will also increase the need for mining engineers. In addition, exploration for all other minerals is also increasing. Easily mined deposits are being depleted, creating a need for engineers to devise more efficient methods for mining low-grade ores. Employment opportunities also will arise as new alloys and new uses for metals increase the demand for less widely used ores. Recovery of metals from the sea and the development of recently discovered oil shale deposits could present major challenges to the mining engineer. (See introductory part of this section for information on training requirements and earnings. See also statement on Mining elsewhere in the *Handbook*.)

Sources of Additional Information

The Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, 345 E. 47th St., New York, N.Y. 10017.

PETROLEUM ENGINEERS

(D.O.T. 010.081)

Nature of the Work

Petroleum engineers are mainly involved in drilling for and producing oil and gas. They work to achieve the maximum profitable recovery of oil and gas from a petroleum reservoir by determining and developing the best and most efficient drilling methods.

Since only a small proportion of the oil and gas in a reservoir will flow out under natural forces, petroleum engineers develop and use various artificial recovery methods such as flooding the oil field with water to force the oil to the surface. Even when using the best recovery methods, about half the oil is still left in the ground. Petroleum engineers' research and development efforts to increase the proportion of oil recovered in each reservoir can make a significant contribution to increasing available energy resources.

Places of Employment

Over 12,000 petroleum engineers were employed in 1974, mostly in the petroleum industry and closely allied fields. Their employers include not only the major oil companies, but also the thousands of smaller independent oil exploration and production companies. They also work for companies that produce drilling equipment and supplies. Some petroleum engineers work in banks and other financial institutions, which need their knowledge of the economic value of oil and gas properties. A small number work for engineering consulting firms or as independent consulting engineers, and for Federal and State governments.

The petroleum engineer's work is concentrated in places where oil and gas is found. Almost three-fourths of all petroleum engineers are employed in the oil producing States of Texas, Oklahoma, Louisiana, and California. There are many American petroleum engineers working overseas in oil producing countries.

Employment Outlook

The employment of petroleum engineers is expected to grow faster than the average for all occupations through the mid-1980's. Economic expansion will require increasing supplies of petroleum and natural gas, even with energy conservation measures. With efforts to attain energy self-sufficiency, and high petroleum prices, increasingly sophisticated and expensive recovery methods will be used. Also, new sources of oil such as oil shale and new offshore oil sources may be developed. All of these factors will contribute to increasing demand for petroleum engineers. (See introductory part of this section for information on training requirements and earnings.)

Sources of Additional Information

Society of Petroleum Engineers of AIME, 6200 North Central Expressway, Dallas, Tex. 75206.

Petroleum engineer examines a cross section plot of a petroleum reservoir.

ENVIRONMENTAL SCIENTISTS

Environmental scientists help us understand our physical environment. They play an important role in solving environmental pollution problems. These scientists, sometimes known as earth scientists, are concerned with the history, composition, and characteristics of the earth's surface, interior, and atmosphere. Some do basic research to increase scientific knowledge, while others do applied research and use knowledge gained from basic research to help solve practical problems. Geologists, for example, explore for new sources of oil, other fuels, and ores. Most meteorologists forecast the weather. Many environmental scientists teach in colleges and universities.

This chapter discusses four environmental science occupations—geologists, geophyscists, meteorologists, and oceanographers.

GEOLOGISTS

(D.O.T. 024.081)

Nature of the Work

Geologists study the structure, composition, and history of the earth's crust in order to locate natural resources, give warnings of natural disasters, and insure that buildings are constructed on firm foundations. By examining surface rocks and drilling to recover rock cores, they determine the distribution, thickness, and slope of the rocks beneath the earth's surface. They also identify rocks and minerals, conduct geological surveys, draw maps, take measurements, and record data.

Geologists use many tools and instruments such as hammers, chisels, levels, transits (mounted telescopes used to measure angles), gravity meters, cameras, compasses, and seismographs (instruments that record the intensity and duration of earthquakes and earth tremors). They may evaluate information from photographs taken from aircraft and satellites and use computers to record and analyze data.

Geologists may also work in laboratories where they examine the chemical and physical properties of specimens under controlled temperature and pressure. They may study fossil remains of animal and vegetable life or experiment with the flow of water and oil through rocks. Laboratory equipment used by geologists includes complex instruments such as the X-ray diffractometer, which determines the structure of minerals, and the petrographic microscope for close study of rock formations.

Besides locating resources and working in laboratories, geologists are also called on to advise construction companies and governmental agencies on the suitability of certain locations for constructing buildings, dams, or highways. Some geologists administer and manage research and exploration programs. Others teach and work on research projects in colleges and universities.

Geologists usually specialize in one or a combination of three general areas—earth materials, earth processes, and earth history.

Economic geologists locate earth materials such as minerals and solid fuels. *Petroleum geologists* search for and recover oil and natural gas. Some petroleum geologists work near drilling sites and others correlate petroleum related geologic information for entire regions. *Engineering geologists* determine suitable sites for the construction of roads, airfields, tunnels, dams, and other structures. They decide, for example, whether underground rocks will bear the weight of a building or whether a proposed structure may be in an eearthquake prone-area. *Mineralogists* analyze and classify minerals and precious stones according to composition and structure. *Geochemists* study the chemical composition and changes in minerals and rocks to understand the distribution and migration of elements in the earth's crust.

Geologists concerned with earth processes study landforms and their rock masses, sedimentary deposits (matter deposited by water or wind) and eruptive forces such as volcanoes. *Volcanologists* study active and inactive volcanoes, and lava flows and other eruptive activity. *Geomorphologists* examine landforms and those forces, such as erosion and glaciation, which cause them to change.

Other geologists are primarily concerned with earth history. *Paleontologists* study plant and animal fossils to trace the evolution and development of past life. *Geochronologists* determine the age of rocks and landforms by the radioactive decay of their elements. *Stratigraphers* study the distribution and arrangement of sedimentary rock layers by examining their fossil and mineral content.

Many geologists specialize in new fields that require knowledge of another science as well. *Astrogeologists* study geological conditions on other planets. *Geological oceanographers* study the sedimentary and other rock on the ocean floor and continental shelf. (See statements on Oceanographers and Mining elsewhere in the *Handbook*.)

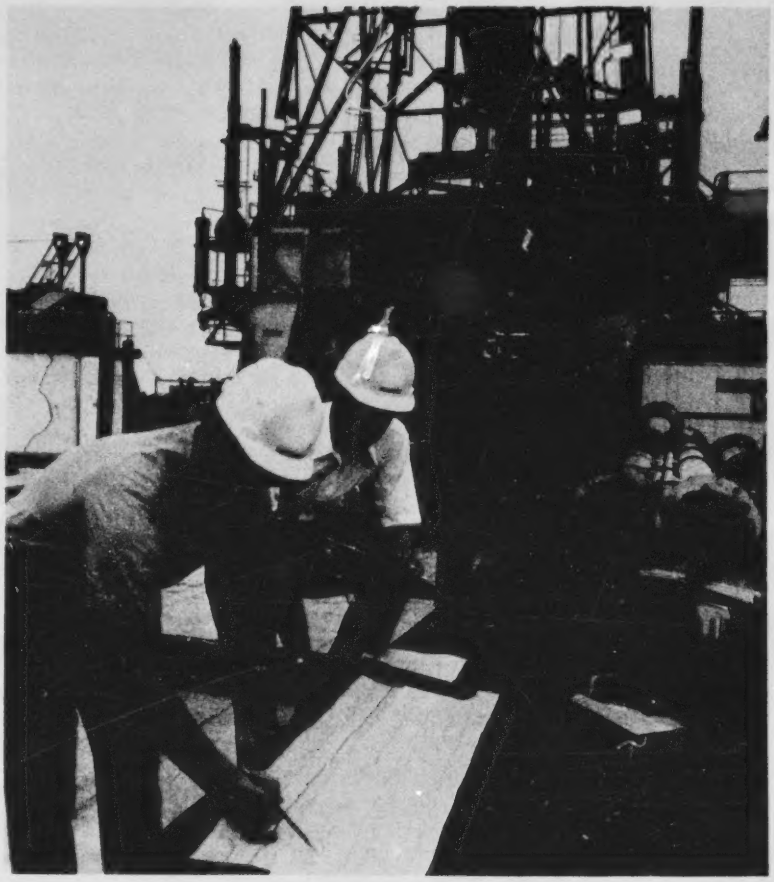
Places of Employment

More than 23,000 people worked as geologists in 1974, approximately 10 percent of them women. Almost three-fifths of all geologists work in private industry. Most industrial geologists work for petroleum companies. Geologists also work for mining and quarrying companies. (See statement on the Mining and Petroleum Industry elsewhere in the *Handbook*.) Some are employed by construction firms. Others are independent consultants to industry and government.

The Federal Government employs over 1,600 geologists. Two-thirds work for the Department of the Interior in the U.S. Geological Survey, the Bureau of Mines, and the Bureau of Reclamation. State agencies also employ geologists, some working on surveys in cooperation with the U.S. Geological Survey.

Colleges and universities employ almost 7,500 geologists. Some work for nonprofit research institutions and museums.

Employment of geologists is concentrated in those States with large oil and mineral deposits. Almost two-thirds work in five States: Texas, California, Louisiana, Colorado, and Oklahoma. Some are employed by American firms overseas for varying periods of time.



Geologists sometimes work in remote places such as this offshore oil rig.

Training, Qualifications, and Advancement

A bachelor's degree in geology or a related field is adequate for entry into many geology jobs. An advanced degree is helpful for advancement in most types of work, and is essential for college teaching and some research positions.

About 300 colleges and universities offer a bachelor's degree in geology. Undergraduate students devote about one-fourth of their time to geology courses, including historical geology, structural geology, mineralogy, petrology, and invertebrate paleontology. Students spend about one-third of their time taking mathematics, related sciences—such as physics and chemistry—and engineering; they spend the remainder on general academic subjects.

More than 160 universities award advanced degrees in geology. Graduate students take advanced courses in geology and specialize in one branch of the science.

Students planning careers in exploration geology should like the outdoors, and must have physical stamina.

Geologists usually begin their careers in field exploration or as research assistants in laboratories. With experience, they can be promoted to project leader, program manager, or other management and research positions.

Employment Outlook

Employment opportunities in geology are expected to be good for those with a bachelor's degree in geology or in a related science with courses in geology; they are expected to be very good for those with advanced degrees in geology or a related science. The employment of geologists is expected to grow faster than the average for all occupations through the mid-1980's, creating several hundred

new openings each year. In addition, a thousand or so openings will be created each year by geologists who retire, die, or transfer to other occupations.

Consumer and industrial demand for petroleum and minerals will continue to rise and efforts to attain energy self-sufficiency will mean that increased supply will come from domestic rather than foreign sources. Geologists will be required to locate and recover new deposits to fill this increased demand. Additional geologists will be needed to discover new resources and their potential uses. For example, geologists will help determine the feasibility of using geothermal energy (steam from the earth's interior) to generate electricity. Geologists are needed to devise techniques for exploring deeper within the earth's crust and to develop more efficient methods of mining resources. They also are needed to develop adequate water supplies and waste disposal methods, and to do site evaluation for construction activities.

Demand for geologists in Federal agencies will continue to grow, particularly in the U.S. Geological Survey. Growth in college and university employment will be at a slower rate than in the past, however.

Earnings and Working Conditions

Geologists have relatively high salaries, with average earnings over twice those of nonsupervisory workers in private industry, except farming.

Starting salaries for new graduates in private industry averaged $10,500 a year in 1974 for those having a bachelor's degree, $12,200 for those having a master's degree, and $16,000 for those having a doctorate, according to the American Geological Institute.

In the Federal Government in late 1974, geologists having a bachelor's degree could begin at $8,500 or $10,520 a year, depending on their college records. Those having a master's degree could start at $10,520 or $12,841 a year; those having the Ph. D. degree at $15,481 or $18,463. In late 1974, the average salary for geologists employed in the Federal Government was almost $24,000 a year.

Conditions of work vary. Exploration geologists often work overseas. Geologists travel to remote sites by helicopter and jeep, and cover large areas by foot, often working in teams. Geologists in mining sometimes work underground. When not working outdoors, they are in comfortable, well-lighted, well-ventilated offices and laboratories.

Sources of Additional Information

General information on career opportunities, training, and earnings for geologists is available from:

American Geological Institute, 5205 Leesburg Pike, Falls Church, Va. 22041.

For information on Federal Government careers, contact:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

GEOPHYSICISTS

(D.O.T. 024.081)

Nature of the Work

Geophysicists study the composition and physical aspects of the earth and its electric, magnetic, and gravitational fields. Geophysicists use highly complex instruments such as the magnetometer which measures variations in the earth's magnetic field, and the gravimeter which measures minute variations in gravitational attraction. They often use satellites to conduct tests in outer space and computers to collect and analyze data.

Geophysicists usually specialize in 1 of 3 general phases of the science—solid earth, fluid earth, and upper atmosphere. Some may also study other planets.

Solid earth geophysicists search for oil and mineral deposits, map the earth's surface, and study earthquakes. *Exploration geophysicists* use seismic prospecting techniques to locate oil and mineral deposits. They send sound waves into the earth and record the echoes bouncing off the rock layers below to determine if conditions are favorable for the accumulation of oil.

Seismologists study the earth's interior and earth vibrations caused by earthquakes and manmade explosions. They explore for oil and minerals, study underground detection of nuclear explosions, and provide information for use in constructing bridges, dams, and buildings. For example, in constructing a dam, seismologists determine where bedrock (solid rock beneath the soil) is closest to the surface so the best dam site can be selected. They use explosives to create sound waves which reflect off bedrock; the time it takes for the shock wave to return to the surface indicates the depth of bedrock.

Geodesists study the size, shape, and gravitational field of the earth and other planets. Their principal task is mapping the earth's surface. With the aid of satellites, geodesists determine the positions, elevations, and distances between points on the earth, and measure the intensity and direction of gravitational attraction.

Hydrologists are concerned with the fluid earth. They may study the distribution, circulation, and physical properties of underground and surface waters, including glaciers, snow, and permafrost. They may also study rainfall and its rate of infiltration into soil. Some are concerned with water supplies, irrigation, flood control, and soil erosion. (See statement on Oceanographers,

Geophysicist prepares a portable seismograph for field operation.

sometimes classified as geophysical scientists, elsewhere in the *Handbook*.)

Geophysicists study the atmosphere, investigate the earth's magnetic and electric fields, and compare its outer atmosphere with those of other planets. *Geomagneticians* study the earth's magnetic field. *Paleomagneticians* learn about past magnetic fields from rocks or lava flows. *Planetologists* study the composition and atmosphere of the moon, planets, and other bodies in the solar system. They gather data from geophysical instruments placed on interplanetary space probes or from equipment used by astronauts during the Apollo missions. *Meteorologists* are sometimes classified as geophysical scientists. (See statement on Meteorologists elsewhere in the *Handbook*.)

Places of Employment

About 8,200 people worked as geophysicists in 1974. Most work in private industry, chiefly for petroleum and natural gas companies. (See statement on the Mining and Petroleum Industry elsewhere in the *Handbook*.) Others are in mining companies, exploration and consulting firms, and research institutes. A few are independent consultants and some do geophysical prospecting on a fee or contract basis.

Geophysicists are employed in many southwestern and western States, including those on the Gulf Coast, where large oil and natural gas fields are located. Some geophysicists are employed by American firms overseas for varying periods of time.

Almost 2,000 geophysicists, geodesists, and hydrologists worked for Federal Government agencies in 1974, mainly the U.S. Geological Survey; the National Oceanic and Atmospheric Administration (NOAA); the Army Map Service; and the Naval Oceanographic Office. Other geophysicists work for colleges and universities, State governments, and nonprofit research institutions.

Training, Other Qualifications, and Advancement

A bachelor's degree in geophysics or a geophysical specialty is sufficient for most beginning jobs in geophysics. A bachelor's degree in a related field of science or engineering also is adequate preparation, provided the person has courses in geophysics, physics, geology, mathematics, chemistry, and engineering.

Geophysicists doing research or supervising exploration activities should have graduate training in geophysics or a related science. Those planning to teach in colleges or do basic research should acquire a Ph. D. degree.

About 50 colleges and universities award the bachelor's degree in geophysics. Other programs offering training for beginning geophysicists include geophysical technology, geophysical engineering, engineering geology, petroleum geology, and geodesy.

More than 60 universities grant the master's and Ph. D. degree in geophysics. Candidates with a bachelor's degree which includes courses in geology, mathematics, physics, engineering, or a combination of these subjects can be admitted.

Geophysicists generally work as part of a team. They should be persons with curious and analytical minds and be able to communicate effectively.

Most new geophysicists begin their careers doing field mapping or

exploration. Some assist senior geophysicists in research laboratories. With experience, geophysicists can advance to such jobs as project leader or program manager, or other management and research jobs.

Employment Outlook

Employment opportunities are expected to be excellent for graduates with a degree in geophysics, as well as for those with a degree in a related field and courses in this specialty. Combined openings, from both occupational growth and replacement needs, are not expected to be numerous in any one year. Nevertheless, new entrants to the field will fall short of requirements if present trends in the number obtaining suitable degrees continue.

Employment of geophysicists is expected to grow faster than the average for all occupations through the mid-1980's. Petroleum and mining companies will need geophysicists for exploration activities, expected to increase over the next decade. As the need for fuel and minerals grows, more geophysicists will be needed, using sophisticated electronic techniques, to find the less accessible fuel and mineral deposits.

In addition, geophysicists with advanced training will be needed to do research on radioactivity and cosmic and solar radiation and to investigate the use of geothermal power (steam from the earth's interior) as a source of energy to generate electricity.

Federal Government agencies are expected to hire more geophysicists for new or expanding programs. Jobs for geophysicists in the Federal Government are heavily dependent on funds for research and development in the earth sciences, which are expected to increase through the mid-1980's. The Government is expected to support energy research into both established and alternative sources. The Government also may fund research to locate more natural resources as well as to prevent environmental damage through better land use.

Earnings and Working Conditions

Geophysicists have relatively high salaries, with average earnings more than twice those of nonsupervisory workers in private industry, except farming.

Starting salaries in 1974 for geophysics graduates averaged $10,500 a year in private industry for those having a bachelor's degree, $12,200 for those having a master's degree and $16,000 for those having a doctorate, according to the American Geological Institute.

In the Federal Government in late 1974, geophysicists having a bachelor's degree could begin at $8,500 or $10,520 a year, depending on their college records. Geophysicists having a master's degree could start at $10,520 or $12,841 a year; those having a Ph. D. degree, at $15,481 or $18,463. In late 1974, the average salary for geophysicists employed by the Federal Government was almost $24,000 a year.

Many geophysicists work outdoors and must be willing to travel for extended periods of time. Some of them work at research stations in remote areas, or aboard ships and aircraft equipped with sophisticated geophysical equipment. When not in the field, geophysicists work in modern, well-equipped, well-lighted laboratories and offices.

Sources of Additional Information

General information on career opportunities, training, and earnings for geophysicists is available from:

American Geophysical Union, 1909 K St. NW., Washington, D.C. 20006

Society of Exploration Geophysicists, P.O. Box 3098, Tulsa, Okla. 74101

For information on Federal Government careers, contact:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St., NW., Washington, D.C. 20415.

METEOROLOGISTS

(D.O.T. 025.088)

Nature of the Work

Meteorology is the study of the atmosphere, which is the air that surrounds the earth. Meteorologists describe and try to understand the atmosphere's physical composition, motions, and processes, and determine the way these elements affect the rest of our physical environment. This knowledge is applied in understanding and forecasting the weather and climate to help solve many practical problems in agriculture, transportation, communications, health, and national defense.

Meteorologists who specialize in forecasting the weather, known professionally as *synoptic meteorologists*, are the largest group of specialists. They study current weather information, such as air pressure, temperature, humidity, and wind velocity, in order to make short- and long-range predictions. Their data come from weather satellites and observers in many parts of the world. Although some forecasters still prepare and analyze weather maps, most data now are plotted and analyzed by computers.

Meteorology however, involves many activities other than weather forecasting. Some meteorologists are engaged in basic and applied research. For example, *physical meteorologists* study the chemical and electrical properties of the atmosphere. They do research on the effect of the atmosphere on transmission of light, sound, and radio waves, as well as study factors affecting formation of clouds, rain,

snow, and other weather phenomena. Other meteorologists, known as *climatologists*, study climatic trends and analyze past records on wind, rainfall, sunshine, and temperature to determine the general pattern of weather that makes up an area's climate. These studies are useful in planning heating and cooling systems, designing buildings, and aiding in effective land utilization.

Other meteorologists apply their knowledge in the study of the relationship between weather and specific human activities, biological processes, and agricultural and industrial operations. For example, they may make weather forecasts for individual companies, or may work on problems such as smoke control and air pollution abatement.

About one-third of all civilian meteorologists work primarily in weather forecasting, and another one-third work in research and development. Almost one-fifth of all civilian meteorologists are in administrative or management positions.

Some meteorologists teach or do research—frequently combining both activities—in colleges and universities. In colleges without separate departments of meteorology, they may teach geography, mathematics, physics, chemistry, or geology, as well as meteorology.

Places of Employment

About 5,600 persons—10 percent of them women—worked as meteorologists in 1974. In addition to these civilian meteorologists, about 2,000 officers and 7,000 enlisted members of the Armed Forces did forecasting and other meteorological work.

The largest employer of civilians was the National Oceanic and Atmospheric Administration (NOAA), where over 1,800 meteorologists worked at stations in all parts of the United States and in a small number of foreign areas. The Department of Defense employed over 200 civilian meteorologists.

Almost 2,000 meteorologists worked for private industry. Commercial airlines employed several hundred to forecast weather along flight routes and to brief pilots on atmospheric conditions. Others worked for private weather consulting firms, for companies that design and manufacture meteorological instruments, and for firms in aerospace, insurance, engineering, utilities, radio and television, and other industries.

Colleges and universities employed over 1,100 meteorologists in research and teaching. A few worked for State and local governments and for nonprofit organizations.

Although meteorologists work in all parts of the country, nearly one-fifth live in just two States—California and Maryland. Almost one-tenth of all meteorologists work in the Washington, D.C. area.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in meteorology is the usual minimum requirement for beginning jobs in weather forecasting. However, a bachelor's degree in a related science or engineering, along with some courses in meteorology, is acceptable for some jobs. For example, the Federal Government's minimum requirement for beginning jobs is a bachelor's degree with at least 20 semester hours of study in meteorology and additional training in physics and mathematics, including calculus. However, an advanced

degree is increasingly necessary for advancement.

For research and college teaching and for many top-level positions in other meteorological activities, an advanced degree is essential, preferably in meteorology. However, people with graduate degrees in other sciences also may qualify if they have advanced courses in meteorology, physics, mathematics, and chemistry.

In 1974, 44 colleges and universities offered a bachelor's degree in meteorology; 59 schools offered advanced degrees in atmospheric science. Many other institutions offered some courses in meteorology.

The Armed Services give and support meteorological training, both undergraduate education for enlisted personnel and advanced study for officers.

NOAA has a program under which some of its meteorologists may attend college for advanced or specialized training. College students can obtain summer jobs with this agency or enroll in its cooperative education program in which they work at NOAA part of the year and attend school part of the year. In addition to helping students finance their education, this program gives them valuable experience for finding a job when they graduate.

Meteorologists in the Federal Government usually start in 2-year training positions at weather stations. They observe weather conditions, receive training in forecasting, and release weather information to the public, agriculture, industry, airlines, and other users. They may advance to assistant forecaster and forecaster.

Airline meteorologists have somewhat limited opportunities for advancement. However, after considerable work experience, they may advance to flight dispatcher or to various supervisory or administrative jobs. A few very well qualified meteorologists with a background in science, engineering, and business administration may establish their own weather consulting services.

Employment Outlook

Job opportunities for meteorologists should be favorable through the mid-1980's. Although the number of openings created by growth in the occupation and replacement needs is not expected to be large in any one year, the number of persons obtaining degrees in meteorology also is small. If trends in the number of degrees granted continue, entrants to the field will about equal requirements.

Employment in the field, as a whole, is expected to increase about as fast as the average for all occupations. Employment of meteorologists in industry and in weather consulting firms is expected to grow as private industry realizes the importance of meteorology to understanding and preventing air pollution. Many companies are also recognizing the value of having their own weather forecasting and meteorological services which can be tailored to fit their needs. There also should be some openings in radio and television as stations increasingly rely on their own meteorologists to prepare and deliver their weather reports. State and local government employment of meteorologists should also grow, and colleges and universities will offer some job opportunities, especially for those with advanced degrees. The employment of civilian meteorologists by the Federal Government is not expected to grow significantly, although there will be openings created by replacement needs.

Earnings and Working Conditions

Meteorologists have relatively high earnings; their salaries are about twice the average for nonsupervisory workers in private industry, except farming.

In early 1974, meteorologists in the Federal Government with a bachelor's degree and no experience received starting salaries of $8,500 or $10,520 a year, depending on their college grades. Those with a master's degree could start at $10,520 or $12,841, and those with the Ph. D. degree at $15,481 or $18,463.

Airline meteorologists had average starting salaries of about $14,400 a year in 1974, and experienced airline meteorologists could receive up to $21,600 a year (See Statement on Occupations in Civil Aviation elsewhere in the *Handbook*.)

Jobs in weather stations, which are operated around the clock 7 days a week, often involve nightwork and rotating shifts. Most stations are at airports or in or near cities; some are in isolated and remote areas. Meteorologists in smaller weather stations generally work alone; in larger ones, they work as part of a team.

Sources of Additional Information

General information on career opportunities and schools offering education in meteorology is available from:

American Meteorological Society, 45 Beacon St., Boston, Mass. 02108.

American Geophysical Union, 1909 K St. NW., Washington, D.C. 20006.

For facts about job opportunities with the NOAA National Weather Service and its student cooperative education program, contact:

Personnel Division AD 41, National Oceanic and Atmospheric Administration, 6010 Executive Blvd., Rockville, Md. 20852.

Details about Air Force meteorological training programs are available from any Air Force recruiting office or from:

Air Weather Service, Information Office, Scott Air Force Base, Ill. 62225.

OCEANOGRAPHERS

(D.O.T. 024.081 and 041.081)

Nature of the Work

Oceans cover more than two-thirds of the earth's surface and provide people with valuable foods, fossil fuels, and minerals. They also influence the weather, serve as a "highway" for transportation, and offer many kinds of recreation. Oceanographers use the principles and techniques of natural science, mathematics, and engineering to study oceans—their movements, physical properties, and plant and animal life. Their research not only extends basic scientific knowledge, but also helps develop practical methods for forecasting weather, developing fisheries, mining ocean resources, and improving national defense.

Some oceanographers make tests and observations and conduct experiments from ships or stationary platforms in the sea. They may study and collect data on ocean tides, currents, and other phenomena. Some study undersea mountain ranges and valleys, oceanic interaction with the atmosphere, and layers of sediment on and beneath the ocean floor.

Oceanographers also work in laboratories on land where, for example, they measure, dissect, and photograph fish. They also study exotic sea specimens and plankton (floating microscopic plants and animals). Much of their work entails identifying, cataloging, and analyzing different kinds of sea life and minerals. At other laboratories, oceanographers plot maps or use computers to test theories about the ocean. For example, they may study and test the theory of continental drift, which states that the continents were once joined together, have drifted apart, and continue to drift apart causing the sea floor to spread. To present the results of their studies, oceanographers prepare charts, tabulations, and reports, and write papers for scientific journals.

Oceanographers explore and study the ocean with aircraft, surface ships, and various types of underwater craft. They use specialized instruments to measure and record the findings of their explorations and studies. Special cameras equipped with strong lights are used to photograph marine life and the ocean floor. Sounding devices are used to measure, map, and locate ocean materials.

Most oceanographers specialize in one branch of the science. *Biological oceanographers* (marine biologists) study plant and animal life in the ocean. They search for ways to extract drugs from marine plants or animals, investigate life processes of marine animals, and determine the effects of radioactivity and pollution on marine life. *Physical oceanographers* (physicists and geophysicists) study the physical properties of the ocean. Their research on the relationships between the sea and the atmosphere may lead to more accurate prediction of the weather. *Geological oceanographers* (marine geologists) study the ocean's mountain ranges, rocks, and sediments. Locating regions where minerals, oil, and gas might be found under the ocean floor is an application of their work. *Chemical oceanographers* investigate the chemical composition of ocean water and sediments as well as chemical reactions in the sea. *Oceanographic engineers* and *electronic specialists* design and build instruments for oceanographic research and operations. They also lay cables and supervise underwater construction.

Most oceanographers work in States that border on the ocean, although there are some oceanographers employed in almost every State. Four out of ten oceanographers work in just three States—California, Maryland, and Virginia.

Places of Employment

About 2,500 persons—about 5 percent of them women—worked as oceanographers in 1974. About one-half worked in colleges and universities, and more than one-fourth for the Federal Government. Federal agencies employing substantial numbers of oceanographers include the Navy and the National Oceanic and Atmospheric Administration (NOAA). Some oceanographers work in private industry; a few work for fishery laboratories of State and local governments.

Training, Other Qualifications, and Advancement

The minimum requirement for beginning professional jobs in oceanography is a bachelor's degree with a major in oceanography, biology, earth or physical sciences, mathematics, or engineering. Professional jobs in research, teaching, and high-level positions in most other types of work require graduate training in oceanography or a basic science.

Only 35 colleges and universities offered undergraduate degrees in oceanography or marine sciences in 1974. However, since oceanography is an interdisciplinary science, undergraduate training in a basic science and a strong interest in oceanography may be adequate preparation for some beginning jobs and would be a good background for graduate training in oceanography.

Important college courses for graduate study in oceanography include mathematics, physics, chemistry, geophysics, geology, meteorology, and biology. In general, students should specialize in the particular science that is closest to their area of oceanographic interest. For example, students interested in chemical oceanography could obtain a degree in chemistry.

In 1974, about 65 colleges offered advanced degrees in oceanog-

Oceanographers collect samples of sea life.

raphy and marine sciences. In graduate schools, students take advanced courses in oceanography and in a basic science.

Graduate students usually work part of the time aboard ship, where they do oceanographic research and become familiar with the sea and with techniques used to obtain oceanographic information. Universities having oceanographic research facilities along our coasts offer summer courses for both graduates and undergraduate students, which are especially beneficial for students from inland universities. Oceanographers should have the curiosity needed to do new research and the patience to collect data and conduct experiments.

Beginning oceanographers with the bachelor's degree usually start as research or laboratory assistants, or in jobs involving routine data collection, computation, or analysis. Most beginning oceanographers receive on-the-job training. The extent of the training varies with the background and needs of the individual.

Experienced oceanographers often direct surveys and research programs or advance to administrative or supervisory jobs in research laboratories.

Employment Outlook

Persons seeking jobs in oceanography may face competition through the mid-1980's. Those with a Ph. D. degree should have more favorable employment opportunities than others, while those with less education may find opportunities limited to routine analytical work as research assistants or technicians.

Employment of oceanographers is expected to grow about as fast as the average for all occupations. This growth will result from increased awareness of the need for ocean research for understanding and controlling pollution, for recovering natural resources, and for national defense. However, growth in employment may not be rapid enough to create enough openings for all those expected to seek entry into this relatively small field. Since the Federal Government finances most oceanographic research, a large increase in Federal spending in oceanography could improve employment prospects.

Earnings and Working Conditions

Oceanographers have relatively high earnings. Their average salaries were more than twice the average received by nonsupervisory workers in private industry, except farming.

In late 1974, oceanographers in the Federal Government with the bachelor's degree received starting salaries of $8,500 or $10,520 a year, depending on their college grades. Those with the master's degree could start at $10,520 or $12,841; and those with the Ph. D. degree at $15,481 or $18,463. The average salary for experienced oceanographers in the Federal Government in late 1974 was about $21,800 a year.

Beginning oceanographers in educational institutions generally receive the same salaries as other faculty members. (See statement on College and University Teachers elsewhere in the *Handbook*.) In addition to regular salaries, many experienced oceanographers earn

extra income from consulting, lecturing, and writing.

Oceanographers engaged in research that requires sea voyages are frequently away from home for weeks or months at a time. Sometimes they live and work in cramped quarters. People who like the sea and oceanographic research often find these voyages satisfying and do not consider the time spent at sea a disadvantage of their work.

Sources of Additional Information

For information about careers in oceanography, contact:

Office of Sea Grant, National Oceanic and Atmospheric Administration, Rockville, Md. 20852.

Dr. George W. Saunders, Secretary, American Society of Limnology and Oceanography, P.O. Box 853, Gaithersburg, Md. 20760.

Federal Government career information is available from any regional office of the U.S. Civil Service Commission or from:

U.S. Civil Service Commission, Washington Area Office, 1900 E St. NW., Washington, D.C. 20415.

The booklet, *Training and Careers in Marine Science*, is available for a small charge from:

International Oceanographic Foundation, 10 Rickenbacker Causeway, Virginia Key, Miami, Fla. 33149.

Some information on oceanographic specialties is available from professional societies listed elsewhere in the *Handbook*. (See statements on Geologists, Geophysicists, Life Scientists, Meteorologists, and Chemists.)

LIFE SCIENCE OCCUPATIONS

Life scientists study living organisms and their life processes. They are concerned with the origin and preservation of life, from the largest animal to the smallest living cell. The number and variety of plants and animals is so large, and their processes so varied and complex, that life scientists usually work in one of the three broad areas—agriculture, biology, or medicine.

Life scientists teach, perform basic research to expand knowledge of living things, and apply knowledge gained from research to the solution of practical problems. New drugs, special varieties of plants, and a cleaner environment result from the work of life scientists.

This chapter discusses life scientists as a group. It also contains separate statements on biochemists and soil scientists.

BIOCHEMISTS

(D.O.T. 041.081)

Nature of the Work

Biochemists study the chemical behavior and chemical nature of living things. Since life is based on complex chemical combinations and reactions, the work of biochemists is vital for an understanding of the basic functions of living things such as reproduction and growth. As part of their study of the chemistry of living things, biochemists may also investigate the effects of substances such as food, hormones, or drugs on various organisms.

The methods and techniques of biochemistry are applied in areas such as medicine and agriculture. For instance, biochemists develop diagnostic procedures or find cures for diseases or identify the nutrients necessary to maintain good health.

More than 3 out of 4 biochemists work in basic and applied research activities. The distinction between basic and applied research is often one of degree and biochemists may do both types. Most, however, are in basic research. The few doing strictly applied research use the results of basic research for practical uses. For example, the knowledge of how an organism forms a hormone is used to develop a process for synthesizing the hormone and producing it on a mass scale.

Laboratory research involves weighing, filtering, distilling, drying, and culturing (growing microorganisms). Some experiments also require sophisticated tasks such as designing and constructing laboratory apparatus or performing tests using radioactive tracers. Biochemists use a variety of instruments, including electron microscopes, and may devise new instruments and techniques as needed. They usually report the results of their research in scientific journals or before scientific groups.

Some biochemists combine research with teaching in colleges and universities. A few work in industrial production and testing activities.

Places of Employment

About 12,400 biochemists were employed in the United States in 1974. Although the exact number of women working in the profession is not known, nearly one-fourth of those receiving advanced degrees in biochemistry in recent years have been women.

More than half of all biochemists are employed in colleges and universities, and most of these do basic and applied research and development in university-operated laboratories and hospitals. Almost one-quarter of all biochemists work in private industry, primarily in companies manufacturing drugs, insecticides, and cosmetics. Nonprofit research institutes and foundations employ some biochemists and some also work for Federal, State, and local government agencies. Most government biochemists do research for Federal agencies concerned with health and agricultural problems. There are a few self-employed biochemists who are consultants to industry and government.

Training, Other Qualifications, and Advancement

The minimum educational requirement for many beginning jobs as a professional biochemist, especially in research or teaching, is an advanced degree. A Ph. D. degree is a virtual necessity for persons who hope to make significant contributions to biochemical research and for advancement to many management and administrative jobs. A bachelor's degree with a major in biochemistry or chemistry, or with a major in biology and a minor in chemistry, may qualify some persons for entry jobs as research assistants or technicians.

More than 50 schools award the bachelor's degree in biochemistry, and nearly all colleges and universities offer a major in biology or chemistry. Regardless of their college major, future biochemists should take undergraduate courses in chemistry, biology, biochemistry, mathematics, and physics.

About 200 colleges and universities offer graduate degrees in

biochemistry. Graduate students generally are required to have a bachelor's degree in biochemistry, biology, or chemistry. Many graduate schools offer programs that emphasize some fields or specialties of biochemistry over others because of the influence of the type of research being done at the school. Therefore, students wishing to specialize should select their schools carefully. Graduate training requires actual research in addition to advanced science courses. For the doctoral degree, the student specializes in one field of biochemistry by doing intensive research and writing a thesis.

Young people planning careers as biochemists should be able to work independently or as part of a team. Precision, keen powers of observation, and mechanical aptitude also are important. Biochemists should have analytical abilities and curious minds, as well as the patience and perseverance needed to complete the hundreds of experiments that may be necessary to solve one problem.

Graduates with advanced degrees may begin their careers as teachers or researchers in colleges or universities. In private industry, most begin in research jobs and with experience may advance to positions in which they plan and supervise research.

New graduates with a bachelor's degree usually start work as research assistants or technicians. These jobs in private industry often involve testing and analysis. In the drug industry, for example, research assistants analyze the ingredients of a product to verify and maintain its purity or quality.

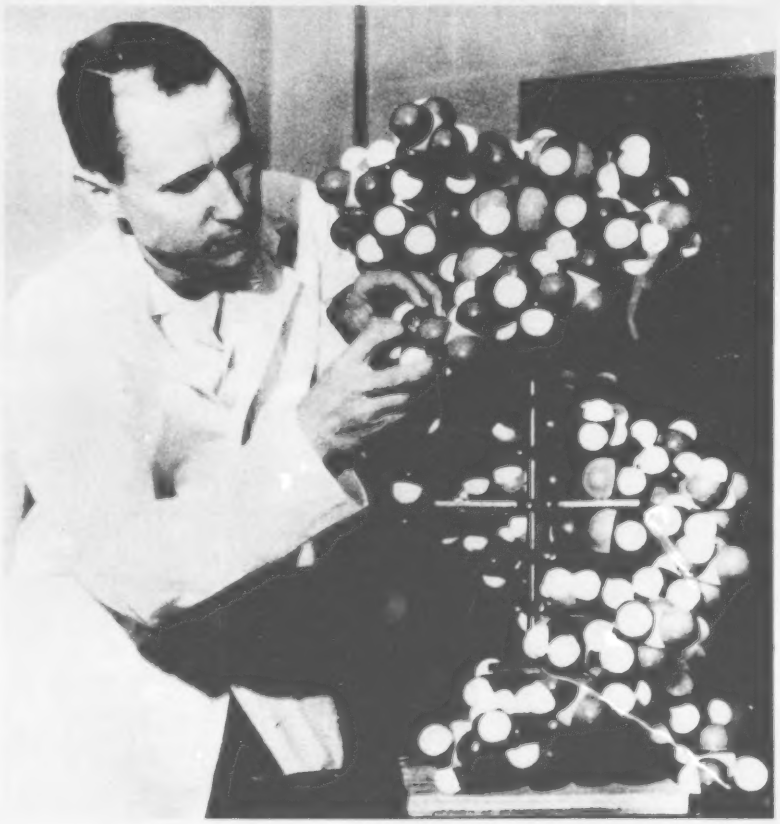
Employment Outlook

Job opportunities for biochemists with advanced degrees should be favorable through the mid-1980's. The employment of biochemists is expected to grow faster than the average for all occupations during this period, creating hundreds of job openings each year. There also will be many openings each year resulting from biochemists who retire, die, or transfer to other occupations. The outlook for biochemists is based on the assumption that research and development expenditures in biochemistry and related sciences, primarily by the Federal Government, will increase through the mid-1980's, although at a slower rate than during the 1960's. If actual research and development expenditures differ significantly from those assumed, the outlook for biochemists would be altered.

The anticipated growth in this field should result from the effort to find cures for cancer, heart disease, and other diseases, and from public concern with environmental protection. Biochemists will also be needed in the drug and other industries and in hospitals and health centers. There will also be some teaching opportunities in colleges and universities, but the recent slowdown in the growth in college enrollments may mean fewer teaching opportunities than in the past.

Earnings and Working Conditions

Biochemists have relatively high salaries; average earnings were about twice the average for all nonsupervisory workers in private industry, except farming. According to a 1974 survey by the American Chemical Society, salaries for experienced biochemists averaged



Biochemist builds a model of a complex molecule.

$15,000 for those with a bachelor's degree; $15,100 for those with a master's degree; and $21,500 for those with a Ph. D.

Starting salaries paid to biochemists employed by colleges and universities are comparable to those for other faculty members. Biochemists in educational institutions often supplement their incomes by engaging in outside research or consulting work.

Sources of Additional Information

For general information on careers in biochemistry, contact:

American Society of Biological Chemists, 9650 Rockville Pike, Bethesda, Md. 20014.

LIFE SCIENTISTS

(D.O.T. 040.081, 041.081, 041.168, 041.181, 041.281)

Nature of the Work

Life scientists study all aspects of living organisms, emphasizing the relationship of animals and plants to their environments.

Almost one-half of all life scientists are in research and development. Many work in laboratories conducting basic research aimed at adding to our knowledge of living organisms. Knowledge gained from this research is applied in medicine, in improvement of crop yields, and to the betterment of the natural environment. When working in laboratories, life scientists must be familiar with research techniques and complex laboratory equipment such as electron microscopes. Knowledge of computers also is useful in conducting some experiments. Not all research, however, is performed in laboratories. For example, a botanist who explores the volcanic Alaskan valleys to see what plants grow there also is doing research.

Life scientist examines animal tissue.

Teaching in a college or university is the major area of work for more than one-fourth of all life scientists, many of whom also do independent research. Almost one-fifth are in some type of management and administrative work that ranges from planning and administering programs for testing foods and drugs to directing activities at zoos or botanical gardens. Some life scientists work as consultants to business firms or to government in their areas of specialization. Others write for technical publications or test and inspect foods, drugs, and other products. Some work in technical sales and services jobs for industrial companies where, for example, they demonstrate the proper use of new chemicals or technical products.

Scientists working in many areas of the life sciences often call themselves *biologists*. However, the majority are classified by the type of organism they study or by the specific activity performed.

Life scientists dealing primarily with plants are *botanists*. Some study all aspects of plant life, while others work in specific areas such as identifying and classifying plants or studying the structure of plants and plant cells. Some botanists concentrate on the cause and cure of plant diseases.

Some life scientists are concerned with the mass development of plants. *Agronomists* improve the quality and yield of crops by developing new growth methods or by controlling disease, pests, and weeds. They also analyze soils to determine ways of increasing acreage yields and decreasing soil ero-

sion. *Horticulturists* work with orchard and garden plants such as fruit and nut trees, vegetables, and flowers. They seek to improve plant culture methods for the purposes of beautification of communities, homes, parks, and other areas as well as for increasing crop quality and yields.

Zoologists concentrate on animal life—its origin, behavior, and life processes. Some conduct experimental studies with live animals and others examine dissected animals in laboratories. Zoologists are usually identified by the animal group studied—ornithologists (birds), entomologists (insects), and mammalogists (mammals).

Animal husbandry specialists do research on the breeding, feeding, and diseases of domestic farm animals. *Veterinarians* study diseases and abnormal functioning in animals. (See statement on Veterinarians elsewhere in the *Handbook*.)

Life scientists who investigate the growth and characteristics of microscopic organisms such as bacteria, viruses, and molds are called *microbiologists*. They isolate organisms and grow them for close examination under a microscope. *Medical microbiologists* are concerned with problems such as the relationship between bacteria and disease or the effect of antibiotics on bacteria. Other microbiologists may specialize in soil bacteriology (effect of micro-organisms on soil fertility), virology (viruses), or immunology (mechanisms that fight infections).

Anatomists study the structure of organisms, from cell structure to the formation of tissues and organs. Many specialize in human anatomy. Research methods may entail dissections or the use of electron microscopes.

Some life scientists apply their specialized knowledge across a number of areas, and may be classified by the functions performed. *Ecologists*, for example, study the mutual relationship among organisms and their environments. They are interested in the effects of environmental influences such as rainfall, temperature, and altitude on organisms. For example, ecologists extract samples of plankton (microscopic plants and animals) from bodies of water to determine the effects of pollution, and measure the radioactive content of fish.

Embryologists study the development of an organism from a fertilized egg through the hatching process or gestation period. They investigate the causes of healthy and abnormal development in organisms.

Nutritionists examine the bodily processes through which food is utilized and transformed into energy. They learn how vitamins, minerals, proteins, and other nutrients build and repair tissues.

Pharmacologists conduct tests on animals such as rats, guinea pigs, and monkeys to determine the effects of drugs, gases, poisons, dusts, and other substances on the functioning of tissues and organs. They may develop new or improved drugs and medicines.

Pathologists specialize in the effects of diseases, parasites, and insects on human cells, tissues, and organs. Others may investigate genetic variations caused by drugs.

Biochemists and biological oceanographers, who are also life scientists, are included in separate statements elsewhere in the *Handbook*.

Places of Employment

An estimated 190,000 persons worked as life scientists in 1974. Almost 50,000 were agricultural scientists, about 75,000 were biological scientists, and almost 65,000 were medical scientists. About one-fifth of all biological and agricultural scientists were women.

Colleges and universities employ nearly three-fifths of all life scientists, in both teaching and research jobs. Medical schools and hospitals also employ large numbers of medical investigators. Sizable numbers of agronomists, horticulturists, animal husbandry specialists, entomologists, and other agriculture-related specialists work for State agricultural colleges and agricultural experiment stations.

About 25,000 life scientists worked for the Federal Government in 1974. Of these, almost half worked for the Department of Agriculture, with large numbers also in the Department of the Interior, and in the National Institutes of Health. State and local governments combined employed 21,000 life scientists.

Approximately 25,000 life scientists work in private industry, mostly in the pharmaceutical, industrial chemical, and food processing industries. More than 4,000 work for nonprofit research organizations and foundations and a few are self-employed.

Life scientists are fairly evenly distributed across the United States, but there are employment concentrations in some metropolitan areas--for example, nearly 6 percent of all agricultural and biological scientists work in the Washington, D.C. metropolitan area. Life science teachers are concentrated in communities with large universities.

Training, Other Qualifications, and Advancement

Young people seeking a career in the life sciences should plan to obtain an advanced degree. The Ph. D. degree generally is required for college teaching and for independent research. It is also necessary for many jobs administering research programs. A master's degree is sufficient for some jobs in applied research and college teaching. A professional health degree is necessary for some jobs in medical research (See section on Health Occupations elsewhere in the *Handbook*.)

The bachelor's degree is adequate preparation for some beginning jobs, but promotions often are limited for those who hold no higher degree. New graduates with a bachelor's degree can start their careers in testing and inspecting jobs, or become technical sales and service representatives. They also may become advanced technicians, particularly in medical research or, with courses in education, a high school biology teacher. (See statement on Secondary School Teachers elsewhere in the *Handbook*.)

Most colleges and universities offer life science curriculums. However, courses differ from one college to another. For example, liberal arts colleges may emphasize the biological sciences, while many State universities and land grant colleges offer good programs in agricultural science.

Young people seeking careers in the life sciences should obtain the broadest possible undergraduate background in biology and other sciences. Courses taken should include biology, chemistry, physics, and mathematics.

Many colleges and universities confer advanced degrees in the life sciences. Requirements for advanced degrees usually include field work and laboratory research as well as classroom studies and preparation of a thesis.

Young people planning careers as life scientists should be able to work independently or as part of a team and must be able to communicate well. Physical stamina is necessary for those interested in research in remote places.

Life scientists who have advanced degrees usually begin in research or teaching jobs. With experience, they may advance to jobs such as supervisors of research programs.

Employment Outlook

Employment opportunities for life scientists are expected to be good for those with advanced degrees through the mid-1980's, but those with lesser degrees may experience competition for available jobs. However, a degree in life science is also useful for entry to occupations related to life science such as research assistant, laboratory technologist, and the health care occupations. Employment in the life sciences is expected to increase faster than the average for all occupations over this period, creating many new jobs. In addition, some openings will occur as life scientists retire, die, or transfer to other occupations.

The growth in employment in the life sciences will be influenced by the increased interest in preserving the natural environment and by a continuing interest in medical research. Employment opportunities in industry and government should increase because of a need for research and development in environmentally related areas and to administer new laws and standards for environmental protection. Greater interest in the environment on the part of college, junior college, and high school students could result in some increased opportunities for life science teachers in these schools. While employment in colleges and universities is expected to increase, it will grow at a slower rate than in the past, primarily because of the anticipated slower overall rate of growth in college and university enrollments.

Earnings and Working Conditions

Life scientists receive relatively high salaries; their average earnings

Life scientist measures the sensitivity of an instrument designed to detect the presence of life in the upper atmosphere.

are more than twice those of nonsupervisory workers in private industry, except farming.

Beginning salary offers in private industry in 1974 averaged $9,420 a year for bachelor's degree recipients in agricultural science and $8,640 a year for bachelor's degree recipients in biological science.

In the Federal Government in late 1974, life scientists having a bachelor's degree could begin at $8,500 or $10,520 a year, depending on their college records. Life scientists having the master's degree could start at $10,520 or $12,841, depending on their academic records or previous work experience. Those having the Ph. D. degree could begin at $15,481 or $18,463. Agricultural and biological scientists in the Federal Government averaged $20,300 a year.

Earnings of all biological scientists averaged about $18,500 a year in 1974. Life scientists who have the M.D. degree generally earn more than other life scientists but less than physicians in private practice.

Most life scientists work in well-lighted, well-ventilated, and clean laboratories. Some jobs, however, require working outdoors under extreme weather conditions, doing strenuous physical work.

Sources of Additional Information

General information on careers in the life sciences is available from:

American Institute of Biological Sciences, 1401 Wilson Boulevard, Arlington, Va. 22209.

American Society for Horticultural Science, National Center for American Horticulture, Mt. Vernon, Va. 22121.

American Physiological Society, Education Office, 9650 Rockville Pike, Bethesda, Md. 20014.

Dr. J. Frank McCormick, Director, Graduate Program in Ecology, University of Tennessee, Knoxville, Tenn. 37916.

Special information on Federal Government careers is available from:

U.S. Civil Service Commission, Washington Area Office, 1900 E St. NW., Washington, D.C. 20415.

SOIL SCIENTISTS

(D.O.T. 040.081)

Nature of the Work

Soil scientists study the physical, chemical, and biological characteristics and behavior of soils. They investigate soils both in the field and in the laboratory and classify them according to a national system of soil classification. From their research, scientists can classify soil to respond to management questions concerning its capability to produce crops, grasses, and trees, and its suitability for the erection of foundations for buildings and other structures. Soil scientists prepare maps, usually based on aerial photographs, on which they plot the individual kinds of soil and other landscape features significant to soil type and management in relation to land ownership lines, field boundaries, roads, and other conspicuous features.

Soil scientists also conduct research to determine the physical and chemical properties of soils to understand their behavior and origin. They predict the yields of cultivated crops, grasses, and trees, under alternative combinations of management practices.

Soil science offers opportunities for those who wish to specialize in soil classification and mapping, soil geography, soil chemistry, soil physics, soil microbiology, and soil management. Training and experience in soil science also will prepare persons for positions as farm managers, land appraisers, and many other professional positions.

Places of Employment

An estimated 3,500 soil scientists were employed in 1974. Most soil scientists are employed by agencies of the Federal Government, State experiment stations, and colleges of agriculture. However, many are employed in a wide range of other public and private institutions, including fertilizer companies, private research laboratories, insurance companies, banks and other lending agencies, real estate firms, land appraisal boards, State conservation departments, and farm management agencies. A few are independent consultants, and others work for consulting firms. An increasing number are employed in foreign countries as research leaders, consultants, and agricultural managers.

Training and Advancement

Training in a college or university of recognized standing is important in obtaining employment as a soil scientist. For Federal employment, the minimum qualification for entrance is a bachelor's degree with a major in soil science or in a closely related field of study, and with 30-semester hours of course work in the biological, physical, and earth sciences, including a minimum of 15 semester hours in soils. In the case of soils research, those having graduate training—especially those with the doctorate—can be expected to advance into a responsible and high paying position. Soil scientists who are qualified for work with both field and laboratory data have a special advantage.

Many colleges and universities offer fellowships and assistantships for graduate training, or employ graduate students for part-time teaching or research.

Employment Outlook

The demand is increasing for soil scientists to help complete the scientific classification and evalua-

tion of the soil resources in the United States. One of the major program objectives of the Soil Conservation Service of the U.S. Department of Agriculture is to complete the soil survey of all rural lands in the United States. This program includes soil classification and soil interpretation for use by agriculturists, engineers, and land-use planners.

Also, demand is increasing for both basic and applied research to increase the efficiency of soil use.

Earnings

The incomes of soil scientists depend upon their education, professional experience, and individual abilities. The entrance salary in the Federal service for graduates having a B.S. degree was $8,500 in late 1974. They may expect advancement to $10,520 after 1 year of satisfactory performance. Further promotion depends upon the individual's ability to do high quality work and to accept responsibility. Earnings of well-qualified Federal soil scientists with several years of experience range from $15,481 to $25,581 a year.

Sources of Additional Information

Additional information may be obtained from the U.S. Civil Service Commission, Washington, D.C. 20415; Office of Personnel, U.S. Department of Agriculture, Washington, D.C. 20250; any office of the Department's Soil Conservation Service; any college of agriculture; or the American Society of Agronomy, 677 S. Segoe Rd., Madison, Wis. 53711.

See also statements on Chemists and Life Scientists.

MATHEMATICS OCCUPATIONS

Mathematics is both a science and a tool essential for many kinds of work. As a tool, mathematics is necessary for understanding and expressing ideas in science, engineering, and, increasingly, in human affairs. The application of mathematical techniques in these fields has increased greatly because of the widespread use of computers, which enable mathematicians to do complex problems rapidly and efficiently. As a result, employment opportunities for persons trained in mathematics have expanded rapidly in recent years.

Young people considering careers in mathematics should be able to concentrate for long periods of time. They should enjoy working independently with ideas and solving problems, and must be able to present their findings in written reports.

This section describes two occupations—mathematician and statistician. A statement on actuaries, a closely related mathematics occupation, is discussed in the section on Insurance Occupations. Entrance into any of these fields requires college training in mathematics. For many types of work, graduate education is necessary.

Many other workers in the natural and social sciences and in data processing use mathematics extensively, although they are not primarily mathematicians. These occupations are discussed elsewhere in the *Handbook*, as are jobs for high school mathematics teachers, covered in the statement on Secondary School Teachers.

Mathematician considers technical problem as explained by engineer.

MATHEMATICIANS

(D.O.T. 020.088)

Nature of the Work

Mathematicians today are engaged in a wide variety of activities, ranging from the creation of new theories to the translation of scientific and managerial problems into mathematical terms.

There are two broad classes of mathematical work: pure (theoretical) mathematics; and applied mathematics, which includes solving numerical problems. Theoretical mathematicians advance mathematical science by developing new principles and new relationships between existing principles of mathematics. They seek to increase basic knowledge without necessarily considering its practical use. Yet, this pure and abstract knowledge has been instrumental in producing many scientific and engineering achievements. For example, in 1854 Bernard Riemann invented a seemingly impractical non-Euclidian geometry that was to become part of the theory of relativity developed by Albert Einstein more than a half-century later.

Mathematicians in applied work use mathematics to develop theories, techniques, and approaches to solve problems in natural science, social science, management, and engineering. Their work ranges from analysis of the reliability of space vehicle systems to studies of the effects of new drugs on disease.

Much work in applied mathematics, however, is carried on by persons other than mathematicians. In fact, the number of workers who depend to a greater or lesser extent upon mathematical expertise is many times greater than the number actually designated as mathematicians.

Places of Employment

About 40,000 persons worked as mathematicians in 1974, about one-fifth of them women.

Roughly three-fourths of all mathematicians worked in colleges and universities. Most were teachers; some worked mainly in research and development with few or no teaching duties.

Most other mathematicians worked in private industry and government. In the private sector, major employers were the aerospace, communications, machinery, and electrical equipment industries. The Department of Defense employed most of the mathematicians working in the Federal Government.

Mathematicians work in all States, but are concentrated in those with large industrial areas and large college and university enrollments. Nearly half of the total are employed in seven States—California, New York, Massachusetts, Pennsylvania, Illinois, Maryland, and New Jersey. Of the total, one-fourth live in three metropolitan areas—New York City; Washington, D.C.; and Los Angeles-Long Beach, California.

Training, Other Qualifications, and Advancement

An advanced degree is the basic requirement for beginning teaching jobs, as well as for most research positions. In most colleges and universities, the Ph. D. degree is necessary for full faculty status.

Advanced degrees are also required for an increasing number of jobs in industry and government, in research, and in many areas of applied mathematics. However, the bachelor's degree is adequate preparation for many positions in private industry and the Federal Government.

Some new graduates having a bachelor's degree assist senior mathematicians by performing computations and solving less advanced problems in applied research. Others work as research or teaching assistants in colleges and universities while studying for an advanced degree.

The bachelor's degree in mathematics is offered by most colleges and universities. Mathematics courses usually required for a degree are analytical geometry, calculus, differential equations, probability and statistics, mathematical analysis, and modern algebra. A prospective college mathematics student should take as many mathematics courses as possible while still enrolled in high school.

More than 400 colleges and universities have programs leading to the master's degree in mathematics; about 150 also offer the Ph. D. In graduate school, students build upon the basic knowledge acquired in earlier studies. They usually concentrate on a specific field of mathematics, such as algebra, mathematical analysis, or statistics, by conducting research and taking advanced courses.

For work in applied mathematics, training in the field in which the mathematics will be used is very important. Fields in which applied mathematics is used extensively include physics, engineering, and operations research; of increasing importance are business and industrial management, economics, statistics, chemistry and life sciences, and the behavioral sciences. Training in numerical analysis and programming is especially desirable for mathematicians working with computers.

Mathematicians need good reasoning ability, persistence, and the ability to apply basic principles to new types of problems. They must be able to communicate well with others since they often must listen to a non-mathematician describe a problem in general terms, and check and recheck to make sure they understand the mathematical solution that is needed.

Employment Outlook

Although employment of mathematicians is expected to increase about as fast as the average for all occupations through the mid-1980's, this rate of growth is slower than occurred in the past. Even if the number of degrees granted in mathematics each year remains at its present level, the number of people seeking employment is expected to exceed job openings. As a result, persons seeking employment as mathematicians are expected to face keen competition throughout the period.

Theoretical mathematicians are expected to have the most difficulty in finding employment. They have traditionally worked in colleges and universities, where employment growth is now expected to be slowest.

Holders of advanced degrees in applied mathematics should have the least difficulty in finding satisfactory employment. Private industry and governmental agencies will need applied mathematicians for work in operations research, numerical analysis, computer systems programming, applied mathematical physics, market research and commercial surveys, and as consultants in industrial laboratories. Work in applied mathematics requires both a high degree of mathematical competence and a knowledge of the field of application.

College graduates with degrees in mathematics should be able to find jobs in other fields, because the education necessary for a degree in mathematics is also a good background for other jobs that rely heavily on the application of mathematical theories and methods. Mathematics majors are likely to find openings in statistics, actuarial work, computer programming, systems analysis, economics, engineering, and physical and life sciences. Employment opportunities in these fields will probably be best for those who combine a major in mathematics with a minor in one of these subjects.

New graduates will also find openings as high school mathematics teachers after completing professional education courses and other requirements for a State teaching certificate. (See statement on Secondary School Teachers elsewhere in the *Handbook*.)

Earnings and Working Conditions

In 1974, mathematicians earned average salaries over twice as high as the average for nonsupervisory workers in private industry, except farming. Starting salaries for mathematicians with a bachelor's degree averaged about $10,300 a year. Those with a master's degree could start at about $12,500 annually. Salaries for new graduates having the Ph. D., most of whom had some experience, averaged over $16,000.

In the Federal Government in 1974, mathematicians having the bachelor's degree and no experience could start at either $8,500 or $10,520 a year, depending on their college records. Those with the master's degree could start at $12,841 or $15,481; and persons having the Ph. D. degree could begin at either $15,481 or $18,463. The average salary for all mathematicians in the Federal Government was about $21,500 in 1974.

Salaries paid to college and university teachers vary greatly depending both on the quality and location of the school and the ability and experience of the individual. According to the American Mathematical Society, college and university teachers generally earned from as low as $8,000 a year (instructors) to as high as $25,000 a year (professors)in 1974. Some were paid over $30,000 annually.

Mathematicians on college and university staffs often supplement their regular salaries with income from summer teaching, special research projects, consulting, and writing.

Sources of Additional Information

Several brochures are available that give facts about the field of mathematics, including career opportunities, professional training, and colleges and universities with degree programs.

Seeking Employment in the Mathematical Sciences is available for 25 cents from:

American Mathematical Society, P.O. Box 6248, Providence, R.I. 02940.

Professional Opportunities in Mathematics (50 cents) and *Guide Book to Departments in the Mathematical Sciences* (75 cents) are provided by:

Mathematical Association of America, 1225 Connecticut Ave. NW., Washington, D.C. 20036.

For specific information on careers in applied mathematics, contact:

Society for Industrial and Applied Mathematics, 33 S. 17th St., Philadelphia, Pa. 19103.

For Federal Government career information, contact any regional office of the U.S. Civil Service Commission or:

Interagency Board of U.S. Civil Service Examiners, 1900 E St. NW., Washington, D.C. 20415.

STATISTICIANS

(D.O.T. 020.188)

Nature of the Work

Statistics are numbers that help describe the characteristics of the world and its inhabitants. Statisticians devise, carry out and analyze surveys and experiments, and interpret their numerical results. In doing so, they apply their knowledge of statistical methods to a particular subject area, such as economics, human behavior, natural science, or engineering. They may use statistical techniques to predict population growth or economic conditions, develop quality control tests for manufactured products, or help business managers and government officials make decisions and evaluate the results of new programs.

Often statisticians are able to obtain accurate information about a group of people or things by surveying a sample, rather than the whole group. For example, television rating services ask only a few thousand families, rather than all viewers, what programs they watch. Statisticians decide where to get the data, determine the type and size of the sample group, and develop the survey questionnaire or reporting form. They also prepare instructions for workers who will tabulate the returns. Statisticians who design experiments prepare mathematical models to test a particular theory. Those in analytical work interpret collected data and summarize their findings in tables, charts, and written reports. Some statisticians, called mathematical statisticians, use mathematical theory to design and improve statistical methods.

Because the field of statistics has such a wide application, it is sometimes difficult to distinguish statisticians from specialists in other fields who use statistics. For example, a statistician working with data on economic conditions may have the title of economist.

Places of Employment

Approximately 24,000 persons—about one-third of them women—worked as statisticians in 1974. About 2 out of 3 statisticians were in private industry, primarily in manufacturing, public utilities, finance, and insurance companies. Roughly one-eighth worked for the Federal Government, primarily in the Departments of Commerce; Agriculture; Defense; and Health, Education, and Welfare. Others worked in State and local government and colleges and universities.

Although statisticians work in all

Statistician assembles data for market research project.

parts of the country, most are in metropolitan areas, and about one-fourth lived in three areas—New York City; Washington, D.C.; and Los Angeles-Long Beach, California.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in statistics or mathematics is the minimum educational requirement for many beginning jobs in statistics. For other beginning statistical jobs, however, a bachelor's degree with a major in an applied field such as economics or natural science and a minor in statistics is preferable. A graduate degree in mathematics or statistics is essential for college and university teaching and helpful for promotion to top administrative and consulting jobs.

About 120 colleges and universities offered statistics as a concentration for a bachelor's degree in 1974. Schools offer either a degree in mathematics or a sufficient number of courses in statistics to qualify graduates for beginning positions. Required subjects for statistics majors include mathematics through differential and integral calculus, statistical methods, and probability theory. Courses in computer uses and techniques are useful for many jobs. For quality control positions, training in engineering or a physical or biological science and in the application of statistical methods to manufacturing processes is desirable. For many market research, business analysis, and forecasting jobs, courses in economics and business administration are helpful.

Over 100 colleges and universities offered graduate degrees in statistics in 1974, and many other schools offered one or two graduate level statistics courses. The usual requirement for entering a graduate program is a bachelor's degree with a good background in mathematics.

Beginning statisticians who have only the bachelor's degree often spend much of their time performing routine work under the supervision of an experienced statistician. Through experience, they may advance to positions of greater technical and supervisory responsibility.

Employment Outlook

Employment opportunities for persons who combine training in statistics with knowledge of a field of application are expected to be favorable through the mid-1980's. Besides the faster than average growth expected in this field, additional statisticians will be needed to replace those who die, retire, or transfer to other occupations.

Private industry will require increasing numbers of statisticians for quality control in manufacturing. Statisticians with a knowledge of engineering and the physical sciences will find jobs working with scientists and engineers in research and development. Business firms will rely more heavily than in the past on statisticians to forecast sales, analyze business conditions, modernize accounting procedures, and help solve management problems.

Government agencies will need statisticians for existing and new programs in fields such as social security, health, education, and economics. Colleges and universities will employ others to teach a growing number of students, as the broader use of statistical methods makes such courses increasingly important to persons majoring in fields other than mathematics and statistics.

Earnings and Working Conditions

In 1974, the average salary of statisticians exceeded $21,000 a year, much higher than the average for all nonsupervisory workers in private industry, except farming. New college graduates averaged about $10,000 a year, according to the limited information available. Those with the master's degree could start at about $12,500 a year, while Ph. D. recipients could start at around $16,000.

In the Federal Government in 1974, statisticians who had the bachelor's degree and no experience could start at either $8,500 or $10,520 a year, depending on their college grades. Beginning statisticians with the master's degree could start at $12,841 or $15,481. Those with the Ph. D. could begin at $15,481 or $18,463.

Statisticians employed by colleges and universities generally receive salaries comparable to those paid other faculty members. (See statement on College and University Teachers.) In addition to their regular salaries, statisticians in educational institutions sometimes earn extra income from outside research projects, consulting, and writing.

Sources of Additional Information

For information about career opportunities in statistics, contact:

American Statistical Association, 806 15th St. NW., Washington, D.C. 20005.

Facts on Federal Government jobs are available from:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20414. For information on a career as a mathematical statistician, contact:

Institute of Mathematical Statistics, 1367 Laurel St., San Carlos, Calif. 94070.

PHYSICAL SCIENTISTS

Physical scientists deal with the basic principles of science. Many do basic research to increase man's knowledge of the properties of matter and energy. Others do basic and applied research, and develop new products and processes. For example, chemists in applied research use their knowledge of the interactions of various chemicals to improve the quality of products. Besides research and development, many physical scientists, particularly chemists and food scientists, work in production and sales-related activities in industry.

This section describes four physical science occupations—chemists, physicists, astronomers, and food scientists. Engineers, life scientists, and environmental scientists also require a background in the physical sciences; these occupations are described in separate sections elsewhere in the *Handbook*.

ASTRONOMERS

(D.O.T.021.088)

Nature of the Work

Astronomers seek answers to questions about the fundamental nature of the universe, such as its origin and history and the evolution of our solar system. Astronomers—sometimes called *astrophysicists*—use the principles of physics and mathematics to study and determine the behavior of matter and energy in distant galaxies. One application of the information they gain is to prove or disprove theories of the nature of matter and energy such as Einstein's theory of relativity.

To make observations of the universe, astronomers use large telescopes, radiotelescopes, and other instruments which can detect electromagnetic radiation from distant sources. Astronomers of today spend little time visually observing stars through telescopes because photographic and electronic light detecting equipment is more effective with dim or distant stars and galaxies. By using spectroscopes to analyze light from stars astronomers can determine their chemical composition. Astronomers also use radiotelescopes and other electronic means to observe radio waves, X-rays, and cosmic rays. Electronic computers are used to analyze data and to solve complex mathematical equations that astronomers develop to represent various theories. Computers also are useful for processing astronomical data to calculate orbits of asteroids or comets, guide spacecraft, and work out tables for navigational handbooks.

Astronomers usually specialize in one of the many branches of the science such as instruments and techniques, the sun, the solar system, and the evolution and interiors of stars.

Astronomers who work on observational programs begin their studies by deciding what stars or other objects to observe and the methods and instruments to use. They may need to design optical measuring devices to attach to the telescope to make the required measurements. After completing their observations, they analyze the results, present them in precise numerical form, and explain them on the basis of some theory. Astromomers usually spend relatively little time in actual observation and relatively more time in analyzing the large quantities of data that observatory facilities collect.

Some astronomers concentrate on theoretical problems and seldom visit observatories. They formulate theories or mathematical models to explain observations made earlier by other astronomers. These astronomers develop mathematical equations using the laws of physics to compute, for example, theoretical models of how stars change as their nuclear energy sources become exhausted.

Almost all astronomers do research or teach; those in colleges and universities often do both. In schools that do not have separate departments of astronomy or only small enrollments in the subject, they often teach courses in mathematics or physics as well as astronomy. Some astronomers administer research programs, develop and design astronomical instruments, and do consulting work.

Places of Employment

Astronomy is the smallest physical science; only 2,000 persons, roughly 7 percent of them women, worked as astronomers in 1974. Most astronomers work in colleges and universities. Some work in observatories operated by universities, nonprofit organizations, or the Federal Government.

The Federal Government employed almost 600 astronomers in 1974. Most worked for the National Aeronautics and Space Administration. Others worked for the Department of Defense, mainly at the U.S. Naval Observatory and the U.S. Naval Research Laboratory. A few astronomers worked for firms in the aerospace field, or in museums and planetariums.

Training, Other Qualifications, and Advancement

The usual requirement for a job in astronomy is a Ph.D. degree. Per-

Astronomer records data collected by a radio telescope.

sons with less education may qualify for some jobs; however, high-level positions in teaching and research and advancement in most areas are open only to those with the doctorate.

Many students who undertake graduate study in astronomy have a bachelor's degree in astronomy. In 1974, about 50 colleges and universities had programs leading to the bachelor's degree in astronomy. However, most students with a bachelor's degree in physics, or in mathematics with a physics minor, can usually qualify for graduate programs in astronomy. Students planning to become astronomers usually study physics, mathematics, and chemistry. Courses in statistics, computer science, optics, and electronics also are useful. In schools with astronomy departments, students also take introductory courses in astronomy and astrophysics, and in astronomical techniques and instruments.

About 55 universities offer the Ph. D. degree in astronomy. These programs include advanced courses in astronomy, physics, and mathematics. Some schools require that graduate students spend several months working at an observatory. In most institutions, the work program leading to the doctorate is flexible and allows students to take courses in their own particular area of interest.

Persons planning careers in astronomy should have imagination and an inquisitive mind. Perseverance and the ability to concentrate on detail and to work independently also are important.

New graduates with a bachelor's or master's degree in astronomy usually begin as assistants in observatories, planetariums, large departments of astronomy in colleges and universities, Government agencies, or industry. Some work as research assistants while studying toward advanced degrees. New graduates with the doctorate can qualify for teaching and research jobs in colleges and universities and for research jobs in Government and industry.

Employment Outlook

Persons seeking positions as astronomers will face keen competition for the few available openings expected through the mid-1980's. Employment of astronomers is expected to grow slowly, if at all, because the funds available for basic research in astronomy, which come mainly from the Federal Government, are not expected to increase enough to create many new positions. Most openings will occur as replacements for those who die or retire. Since astronomy is such a small profession, there will be few openings needed for replacements. There will be a large number of people competing to fill these openings because the number of degrees granted in astronomy probably will continue to exceed available openings.

Earnings and Working Conditions

Astronomers have relatively high salaries, with average earnings much higher than the average for nonsupervisory workers in private industry, except farming.

In the Federal Government in late 1974, astronomers holding the Ph. D. degree could begin at $15,481 or $18,463, depending on their college record. Those having the bachelor's degree could start at $8,500 or $10,520; with the

master's degree at $10,520 or $12,841. The average annual salary for astronomers and space scientists in the Federal Government was about $27,600 in late 1974. Astronomers teaching in colleges and universities received salaries equivalent to those of other faculty members. (See statement on College and University Teachers elsewhere in the *Handbook*.)

Most astronomers spend most of their time working in offices or classrooms, although astronomers who make observations may need to travel to the observing facility and may occasionally work at night.

Sources of Additional Information

For information on careers in astronomy and on schools offering training in the field, contact:

American Astronomical Society, 211 Fitz-Randolph Rd., Princeton, N.J. 08540.

CHEMISTS

(D.O.T. 022.081, .168, .181, and .281)

Nature of the Work

The clothes we wear, the foods we eat, the houses in which we live—in fact most things that help make our lives better, from medical care to a cleaner environment—result, in part, from the work done by chemists.

Chemists search for and put into practical use new knowledge about substances. They develop new compounds, such as rocket fuel; improve foods; and create clothing that is chemically treated against flammability, soil, and wrinkles.

Over one-half of all chemists work in research and development. In basic research, chemists investigate the properties and composition of matter and the laws that govern the combination of elements. Basic research often has practical uses. For example, synthetic rubber and plastics have resulted from research on small molecules uniting to form larger ones (polymerization). In research and development, new products are created or improved. The process of developing a product begins with descriptions of needed items. If similar products exist, chemists test samples to determine their ingredients. If no such product exists, experimentation with various substances yields a product with the required specifications.

Nearly one-fifth of all chemists work in production and inspection. In production, chemists prepare instructions (batch sheets) for plant workers which specify the kind and amount of ingredients to use and the exact mixing time for each stage in the process. At each step, samples are tested for quality control to meet industry and government standards. Records and reports show results of tests.

Others work as marketing or sales representatives to obtain technical knowledge of products sold. A number of chemists teach in colleges and universities. Some chemists are consultants to private industry and government agencies.

Chemists often specialize in one of the subfields of chemistry. *Analytical chemists* determine the structure, composition, and nature of substances, and develop new techniques. An outstanding example was the analysis of moon rocks by an international team of analytical chemists. *Organic chemists* originally studied the chemistry of living things, but this area has been broadened to include all carbon compounds. When combined with other elements, carbon forms an incredible variety of substances. Many modern commercial products, including plastics and other synthetics, have resulted from this work. *Inorganic chemists* study compounds other than carbon. They may develop, for example, materials to use in solid state electronic components. *Physical chemists* study energy transformations to find new and better energy sources. Increasingly, however, chemists consider themselves members of new specialties which include two of the preceding fields or more. *Biochemists*, often considered as either chemists or life scientists, are discussed elsewhere in the *Handbook*. Some chemists specialize in the chemistry of foods. (See statement on Food Scientists elsewhere in the *Handbook*.)

Chemists study model of ethylene dinitramine.

Places of Employment

Nearly 135,000 persons worked as chemists in 1974; about 10 percent were women. Nearly three-fourths of all chemists work in private industry; almost one-half are in the chemicals manufacturing industry. Most others work for companies manufacturing food, scientific instruments, petroleum, paper, and electrical equipment.

Colleges and universities employed 25,000 chemists. Smaller numbers worked for nonprofit research organizations; and State and local governments, primarily in health and agriculture; Federal agencies, chiefly the Departments

of Defense; Health, Education, and Welfare; Agriculture; and Interior.

Chemists are employed in all parts of the country, but they are concentrated in large industrial areas. Nearly one-fifth of all chemists were located in four metropolitan areas—New York, Chicago, Philadelphia, and Newark. About half of the total worked in six States—New York, New Jersey, California, Pennsylvania, Ohio, and Illinois.

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in chemistry or a related discipline is sufficient for many beginning jobs as a chemist. However, graduate training is required for many research and college teaching positions. Beginning chemists should have a broad background in chemistry, with good laboratory skills.

Over 1,100 colleges and universities offer a bachelor's degree in chemistry. In addition to required courses in analytical, inorganic, organic, and physical chemistry, undergraduates usually study mathematics and physics.

More than 350 colleges and universities award advanced degrees in chemistry. In graduate school, students generally specialize in a particular subfield of chemistry. Requirements for the master's and doctor's degree usually include a thesis based on independent research.

Students planning careers as chemists should enjoy studying science and mathematics, and should like working with their hands building scientific apparatus and performing experiments. Perseverance and the ability to concentrate on detail and work independently are essential. Other desirable assets include an inquisitive mind, and imagination. Chemists also should have good eyesight and eye-hand coordination.

Graduates with the bachelor's degree generally begin their careers in government or industry by analyzing or testing products, working in technical sales or service, or assisting senior chemists in research and development laboratories. Many employers have special training and orientation programs which are concerned with the special knowledge needed for the employer's type of work. Candidates for an advanced degree often teach or do research in colleges and universities while working toward advanced degrees.

Beginning chemists with the master's degree can usually go into applied research in government or private industry. They also may qualify for teaching positions in 2-year colleges, and some universities.

The Ph.D. generally is required for basic research, for teaching in colleges and universities, and for advancement to many administrative positions.

Employment Outlook

Employment opportunities in chemistry are expected to be good for graduates at all degree levels through the mid-1980's. The employment of chemists is expected to grow faster than the average for all occupations during this period; thousands of new jobs will be created each year. In addition, several thousand openings will result each year as chemists retire, die, or transfer to other occupations.

The outlook for chemists is based on the assumption that research and development expenditures of government and industry will increase through the mid-1980's, although at a slower rate than during the 1960's. If actual R&D expenditures levels differ significantly from those assumed, the outlook for chemists would be altered.

Approximately three-fourths of total employment is expected to be in private industry to develop new products. In addition, industrial companies and government agencies will need chemists to help solve problems related to energy shortages, pollution control, and health care. Some also will work in Federal, State, and local crime laboratories.

Growth in college and university

Chemist regulates the pressure of a gas used in an experiment.

employment is expected to be much slower than in the past; competition for teaching positions will be keen. (See statement on College and University Teachers elsewhere in the *Handbook*.)

New graduates also will find openings in high school teaching after completing professional education courses and other requirements for a State teaching certificate. However, they usually are then regarded as teachers rather than chemists. (See statement on Secondary School Teachers elsewhere in the *Handbook*.)

Earnings and Working Conditions

Chemists averaged more than twice as much as nonsupervisory workers in private industry, except farming. According to the American Chemical Society, experienced chemists having a bachelor's degree averaged $17,500 a year in 1974, for those with a master's degree, $18,400; and for those with a Ph. D., $21,700.

Private industry paid chemists with the bachelor's degree starting salaries averaging $10,200 a year in 1974; those with the master's degree, $12,000; and those with the Ph. D., $16,800.

In colleges and universities, the median salary of those with the master's degree was $13,300 and of those with the Ph. D., $17,200. In addition, many experienced chemists in educational institutions supplement their regular salaries with income from consulting, lecturing, and writing.

Depending on college records, the annual starting salary in the Federal Government in late 1974 for an inexperienced chemist with a bachelor's degree was either $8,500 or $10,520. Those who had 2 years of graduate study could begin at $12,841 a year. Chemists having the Ph. D. degree could start at $15,841 or $18,463. The average salary for all chemists in the Federal Government in late 1974 was $21,500 a year.

Chemists usually work in modern, well-equipped, and well-lighted laboratories, offices, or classrooms. Hazards involve handling potentially explosive or highly caustic chemicals. However, when safety regulations are followed, health hazards are negligible.

Sources of Additional Information

General information on career opportunities and earnings for chemists is available from:

American Chemical Society, 1155 16th St. NW., Washington, D.C. 20036.

Manufacturing Chemists Association, Inc., 1825 Connecticut Ave. NW., Washington, D.C. 20009.

For specific information on Federal Government careers, contact:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

For additional sources of information, see statements on Biochemists, Chemical Engineers, and Industrial Chemical Industry. Information on chemical technicians may be found in the statement on Engineering and Science Technicians.

FOOD SCIENTISTS

(D.O.T. 022.081, 040.081, and 041.081)

Nature of the Work

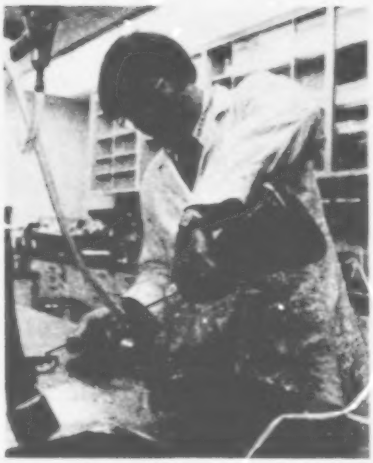
In the past, consumers processed most food in the home, but today, industry processes almost all foods. A keyworker involved in the development and processing of the large variety of foods available today is the *food scientist* or *food technologist*.

Food scientists investigate the chemical, physical, and biological nature of food and apply this knowledge to processing, preserving, packaging, distributing, and storing an adequate, nutritious, wholesome, and economical food supply. About three-fifths of all scientists in food processing work in research and development. Others work in quality assurance laboratories or in production or processing areas of food plants. Some teach or do basic research in colleges and universities.

Food scientists in basic research study the structure and composition of food and the changes it undergoes in storage and processing. For example, they may develop new sources of proteins, study the effects of processing on microorganisms, or search for factors that affect the flavor, texture, or appearance of foods. Food scientists who work in applied research and development create new foods and develop new processing methods. They also seek to improve existing foods by making them more nutritious and enhancing their flavor, color, and texture.

Food scientists insure that each product will retain its characteristics and nutritive value during storage. They also conduct chemical and microbiological tests to see that products meet industry and government standards, and they may determine the nutritive contents of products in order to comply with Federal nutritional labeling requirements.

In quality control laboratories, food scientists check raw ingredients for freshness, maturity, or suitability for processing. They may use machines that test for tenderness by finding the amount of force necessary to puncture the item. Periodically, they inspect processing line operations to insure conformance with government and industry standards. For example, scientists test canned goods for sugar, starch, protein, fat, vitamin, and mineral content. In frozen food plants, they make sure that, after processing, various enzymes are in-



Food scientist does research to develop new food product.

active so that the food will not spoil during storage. Other food scientists are involved in developing and improving packaging and canning methods.

Food scientists in production prepare production specifications, schedule processing operations, maintain proper temperature and humidity in storage areas, and supervise sanitation operations, including the efficient and economical disposal of wastes. To increase efficiency, they advise management on the purchase of equipment and recommend new sources of materials.

Some food scientists apply their knowledge in areas such as market research, advertising, and technical sales. Others teach in colleges and universities.

Places of Employment

About 7,200 persons—more than 10 percent of them women—worked as food scientists in 1974. Food scientists work in all sectors of the food industry and in every State. The types of products on which they work may depend on the locality: for example, in Maine and Idaho they work with potato processing; in the Midwest, with cereal products and meatpacking; and in Florida and California, with orange juice concentrates.

Some food scientists do research for Federal agencies such as the Food and Drug Administration and the Departments of Agriculture and Defense; others work in State regulatory agencies. A few work for private consulting firms and international organizations such as the United Nations. Some teach or do research in colleges and universities. (See statement on College and University Teachers elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

A bachelor's degree with a major in food science, or in one of the physical or life sciences such as chemistry and biology, is the usual minimum requirement for beginning jobs in food science. An advanced degree is necessary for many jobs, particularly research and college teaching, and for some management level jobs in industry.

About 60 colleges and universities offered programs leading to the bachelor's degree in food science in 1974; the Institute of Food Technologists approved over 40 of these. Undergraduate students majoring in food science usually take courses in physics, chemistry, mathematics, biology, the social sciences and humanities, and business administration, as well as a variety of food science courses. Food science courses cover areas such as preservation, processing, sanitation, and marketing of foods.

Most of the colleges and universities that provide undergraduate food science programs also offer advanced degrees. Graduate students usually specialize in a particular area of food science. Requirements for the master's or doctor's degree vary by institution, but usually include laboratory work and a thesis.

Young people planning careers as food scientists should have analytical minds and like details and technical work. Food scientists must be able to express their ideas clearly to others.

Food scientists with a bachelor's degree might start work as quality assurance chemists or as assistant production managers. After gaining experience, they can advance to more responsible management jobs. A food scientist might also begin as a junior food chemist in a research and development laboratory of a food company, and be promoted to section head or another research management position.

People who have master's degrees may begin as senior food chemists in a research and development laboratory. Those who have the Ph. D. degree usually begin their careers doing basic research or teaching.

Employment Outlook

Employment of food scientists is expected to grow faster than the average for all occupations through the mid-1980's. In addition to openings resulting from this growth, some jobs will open each year because of the need to replace those who die, retire, or transfer to other fields.

Employment is expected to grow as the food industry responds to the challenge of providing wholesome and economical foods that can meet changing consumer preferences and food standards. In addition, both private households and food service institutions that supply outlets such as airlines and restaurants will demand a greater quantity of quality convenience foods.

Food scientists with advanced degrees are expected to have more favorable opportunities than those with only the bachelor's degree. Also, those with degrees in food science may have better opportunities than those with degrees in re-

lated fields such as chemistry or biology.

An increasing number of food scientists are expected to find jobs in research and product development. In recent years, expenditures for research and development in the food industry have increased moderately and probably will continue to rise. Through research, new foods are being produced from modifications of wheat, corn, rice, and soybeans. For example, food scientists are working to improve "meat" products made from vegetable proteins. There will be an increased need for food scientists in quality control and production because of the complexity of products and processes and the application of higher processing standards and new government regulations.

Earnings and Working Conditions

Food scientists had relatively high earnings in 1974, much higher than the average for all nonsupervisory workers in private industry, except farming. Food scientists with the bachelor's degree had average starting salaries of about $10,000 a year in 1974. Those with a master's degree started at about $12,000, and those with the Ph. D. degree at about $15,200.

In the Federal Government in late 1974, food scientists with a bachelor's degree could start at $8,500 or $10,520 a year, depending on their college grades. Those with a master's degree could start at $10,520 or $12,841, and those with the Ph. D. degree could begin at $15,481 or $18,463. The average salary for experienced food scientists in the Federal Government was about $22,500 a year in late 1974.

Sources of Additional Information

For information on careers in food science, contact:

Institute of Food Technologists, Suite 2120, 221 North LaSalle St., Chicago, Ill. 60601.

PHYSICISTS

(D.O.T. 023.081 and.088)

Nature of the Work

The flight of astronauts through space, the probing of ocean depths, or even the safety of the family car depend on research by physicists. Through systematic observation and experimentation, physicists describe in mathematical terms the structure of the universe and interaction of matter and energy. Physicists develop theories that describe the fundamental forces and laws of nature. Determining such basic laws governing phenomena such as gravity, electromagnetism, and nuclear interaction leads to discoveries and innovations. For instance, the development of irradiation therapy equipment which destroys harmful growths in humans without damaging other tissues resulted from what physicists know about nuclear radiation. Physicists have contributed to scientific progress in recent years in areas such as nuclear energy, electronics, communications, aerospace, and medical instrumentation.

Two-thirds of all physicists work in research and development. Some do basic research to increase scientific knowledge. For example, they investigate the fundamentals of nuclear structure and the forces between nucleons (nuclear dynamics). The equipment that physicists develop for their basic research can often be applied to other areas. For example, lasers (devices which amplify light and emit electromagnetic waves in a narrow, intense light beam) are utilized in surgery; microwave devices are used for ovens; and measurement techniques and instruments developed by physicists can detect and measure the kind and number of cells in blood or the amount of mercury or lead in foods.

Some engineering-oriented physicists do applied research and help develop new products. For instance, their knowledge of solid-state physics led to the development of transistors and microcircuits used in electronic equipment that ranges from hearing aids to missile guidance systems.

Many physicists teach in colleges and universities. A small number work in inspection, quality control, and other production-related jobs in industry. Some do consulting work.

Most physicists specialize in one or more branches of the science—elementary-particle physics; nuclear physics; atomic, electron, and molecular physics; physics of condensed matter; optics, acoustics, and plasma physics; and the physics of fluids. Some specialize in a subdivision of one of these branches. For example, within solid-state physics subdivisions include ceramics, crystallography, and semiconductors. However, since all physics specialties rest on the same fundamental principles, a physicist's work usually overlaps many specialties.

Growing numbers of physicists are specializing in fields combining physics and a related science—such as astrophysics, biophysics, chemical physics, and geophysics. Furthermore, the practical applications of physicists' work have increasingly merged with engineering.

Places of Employment

About 48,000 people worked as physicists in 1974; about 4 percent were women. Private industry employed over 19,000; almost two-fifths of these were in companies manufacturing chemicals, electrical equipment, and ordnance products. Commercial laboratories and inde-

Physicists develop equipment used in cancer research.

pendent research organizations employ more than one-fourth of the physicists in private industry.

Nearly 21,000 physicists taught or did research in colleges and universities; some did both. About 6,200 physicists were in the Federal Government in 1974, mostly in the Departments of Defense and Commerce. About 1,300 physicists worked in nonprofit organizations.

Although physicists are employed in all parts of the country, their employment is greatest in areas that have heavy industrial concentrations and large college and university enrollments. Nearly one-fourth of all physicists work in four metropolitan areas—Washington, D.C.; Boston, Mass.; New York, N.Y.; and Los Angeles-Long Beach, Calif., and more than one-third are concentrated in three States—California, New York, and Massachusetts.

Training, Other Qualifications, and Advancement

Graduate training in physics or a closely related field is almost essential for most entry level jobs in physics and for advancement in all types of work. The doctorate is usually required for full faculty status at colleges and universities and for industrial or government jobs administering research and development programs.

Those having master's degrees qualify for many research jobs in private industry and in the Federal Government. Some work in colleges and universities, instructing and assisting in research while studying for their Ph.D.

Those having bachelor's degrees qualify for some applied research and development jobs in private industry and in the Federal Government. Some are employed as research assistants in colleges and universities while studying for advanced degrees. Many with a bachelor's degree in physics apply their physics training in jobs in other scientific fields and in engineering. (See statements on Engineers, Geophysicists, Programmers, and Systems Analysts elsewhere in the *Handbook*.)

About 900 colleges and universities offer a bachelor's degree in physics. In addition, many engineering schools offer a physics major as part of the general curriculum. The undergraduate program in physics provides a broad background in the science and serves as a base for later specialization either in graduate school or on the job. Some typical physics courses are mechanics, electricity and magnetism, optics, thermodynamics, and atomic and molecular physics. Students also take courses in chemistry and mathematics.

Almost 300 colleges and universities offer advanced degrees in physics. In graduate school, the student, with faculty guidance, usually works in a specific field. The graduate student, especially the candidate for the Ph. D. degree, spends a large portion of his time in research.

Students planning a career in physics should have an inquisitive mind, mathematical ability, and imagination. They should be able to work on their own, since physicists, particularly in basic research, often receive only limited supervision.

Young physicists often begin their careers doing routine laboratory tasks. After some experience, they are assigned more complex tasks and may advance to work as project leaders or research directors. Some work in top management jobs. Physicists who develop new products frequently

form their own companies or join new firms to exploit their own ideas.

Employment Outlook

Employment opportunities in physics are expected to be good through the mid-1980's. The employment of physicists is expected to grow faster than the average for all occupations over this period, creating more than a thousand new openings each year. In addition, some openings will result as physicists retire, die, or transfer to other occupations.

Some of the past growth in employment of physicists resulted from increases in Federal research and development (R&D) expenditures. Through the mid-1980's, government R&D expenditures are expected to increase, although at a slower rate than during the 1960's. On this basis, more physicists will continue to be required. However, if actual R&D expenditure levels and patterns were to differ significantly from those assumed, the outlook for physicists would be altered.

Some physicists with advanced degrees will be needed to teach in colleges and universities, but competition for these jobs is expected to be keen.

New graduates also will find opportunities as high school physics teachers after completing the required educational courses and obtaining a State teaching certificate. However, they are usually regarded as teachers rather than as physicists. (See statement on Secondary School Teachers elsewhere in the *Handbook*.)

Earnings and Working Conditions

Physicists have relatively high salaries, with average earnings more than twice those of nonsupervisory workers in private industry, except farming. Starting salaries for physicists who had a bachelor's degree averaged about $10,700 a year in manufacturing industries in 1974; a master's degree, $12,800; and a Ph. D., $17,800.

Depending on their college records, physicists with a bachelor's degree could start in the Federal Government in late 1974 at either $8,500 or $10,520 a year. Beginning physicists having a master's degree could start at $10,520 or $12,841, and those having the Ph. D. degree could begin at $15,481 or $18,463. Average earnings for all physicists in the Federal Government in 1974 were $24,700 a year.

Starting salaries on college and university faculties for physicists having a master's degree averaged $9,600 in 1973, and for those having the Ph. D., $12,000. (See statement on College and University Teachers elsewhere in the *Handbook*.) Many faculty physicists supplement their regular incomes by working as consultants and taking on special research projects.

Sources of Additional Information

General information on career opportunities in physics is available from:

American Institute of Physics, 335 East 45th St., New York, N.Y. 10017.

For information on Federal Government careers, contact:

Interagency Board of U.S. Civil Service Examiners for Washington, D.C., 1900 E St. NW., Washington, D.C. 20415.

OTHER SCIENTIFIC AND TECHNICAL OCCUPATIONS

BROADCAST TECHNICIANS

(D.O.T. 194.168, .281, .282, and 782; 957.282; and 963.168 through .887)

Nature of the Work

Broadcast technicians operate and maintain the electronic equipment used to record and transmit radio and television programs. They work with microphones, sound recorders, light and sound effects, television cameras, video tape recorders, and other equipment.

In the control room, broadcast technicians operate equipment that regulates the quality of sounds and pictures being recorded or broadcast. They also operate controls that switch broadcasts from one camera or studio to another, from film to live programming, or from network to local programs. By means of hand signals and, in television, by use of telephone headsets, they give technical directions to personnel in the studio.

When events outside the studios are to be broadcast, technicians may go to the site and set up, test, and operate the equipment. After the broadcast, they dismantle the equipment and return it to the station.

As a rule, broadcast technicians in small stations perform a variety of duties. In large stations and in networks, on the other hand, technicians are more specialized, although specific job assignments may change from day to day. *Transmitter technicians* monitor and log outgoing signals and are responsible for transmitter operation. *Maintenance technicians* set up, maintain, and repair electronic broadcasting equipment. *Audio control technicians* regulate sound pickup, transmission, and switching and *video control technicians* regulate the quality, brightness, and contrast of television pictures. The lighting of television programs is directed by *lighting technicians*. For programs originating outside the studio, *field technicians* set up and operate broadcasting equipment. *Recording technicians* operate and maintain sound recording equipment; *video recording technicians* operate and maintain video tape recording equipment. Sometimes the term "engineer" is substituted for "technician."

Places of Employment

About 22,000 broadcast technicians were employed in radio and television stations in 1974. Most radio stations employ fewer than 4 technicians, although a few large ones have more than 10. Nearly all television stations employ at least 10 broadcast technicians, and those in large metropolitan areas average about 30. In addition to the technicians, some supervisory personnel, with job titles such as chief engineer or director of engineering, work in technical departments.

Broadcast technician gives technical assistance to studio personnel.

Although broadcast technicians are employed in every State, most are located in large metropolitan areas. The highest paying and most specialized jobs are concentrated in New York, Los Angeles, and Washington, D.C.—the originating centers for most of the network programs.

Training, Other Qualifications, and Advancement

A person interested in becoming a broadcast technician should plan to get a Radiotelephone First Class Operator License from the Federal Communications Commission (FCC). Federal law requires that anyone who operates broadcast transmitters in television and radio stations must hold such a license. The FCC also issues a Third Class Operator License which is all that is needed to operate a radio broadcast transmitter. Some stations require all their broadcast technicians, including those who do not operate transmitters, to have one of these licenses. In addition, the chief engineer of each broadcasting station must have an FCC Radiotelephone First Class Operator License. Applicants for these licenses must pass a series of written examinations. These cover construction and operation of transmission and receiving equipment; characteristics of electromagnetic waves; and regulations and practices, both Federal Government and international, which govern broadcasting.

Among high school courses, algebra, trigonometry, physics, elec-

tronics, and other sciences provide valuable background for persons anticipating careers in this occupation. Building and operating an amateur radio station also is good training. Taking an electronics course in a technical school is still another good way to acquire the knowledge for becoming a broadcast technician. Some persons gain work experience as temporary employees while filling in for regular broadcast technicians who are on vacation.

Many schools give courses especially designed to prepare the student for the FCC's first-class license test. Technical school or college training is an advantage for those who hope to advance to supervisory positions or to the more specialized jobs in large stations and in the networks.

Persons with FCC first-class licenses who get entry jobs are instructed and advised by the chief engineer or by other experienced technicians concerning the work procedures of the station. In small stations, they may start by operating the transmitter and handling other technical duties, after a brief instruction period. As they acquire more experience and skill they are assigned to more responsible jobs. Those who demonstrate above-average ability may move into top-level technical positions, such as supervisory technician or chief engineer. A college degree in engineering is becoming increasingly important for advancement to supervisory and executive positions.

Employment Outlook

The number of broadcast technicians is expected to increase about as fast as the average for all occupations through the mid-1980's. Most job openings will result from the need to replace experienced technicians who retire, die, or transfer to other occupations.

Some new job opportunities for technicians will be provided as new radio and television stations go on the air. Demand for broadcast technicians also will increase as cable television stations broadcast more of their own programs. However, laborsaving technical advances, such as automatic programming, automatic operation logging, and remote control of transmitters will limit the demand for technicians.

Earnings and Working Conditions

Salaries of beginning technicians in commerical radio and television ranged from about $135 to $185 a week in 1974 and those of experienced technicians from about $170 to $350, according to the limited information available. As a rule, technicians' wages are highest in large cities and in large stations. Technicians employed by television stations usually are paid more than those who work for radio stations because television work is generally more complex. Technicians employed by educational broadcasting stations generally earn less than those who work for commercial stations.

Most technicians in large stations work a 40-hour week with overtime pay for additional hours. Some broadcast technicians in the larger cities work a 37-hour week. In small stations, many technicians work 4 to 12 hours of overtime each week. Evening, night, and weekend work frequently is necessary since many stations are on the air as many as 24 hours a day, 7 days a week. Network technicians may occasionally have to work continuously for many hours and under great pressure in order to meet broadcast deadlines.

Technicians generally work indoors in pleasant surroundings. The work is interesting and the duties are varied. When remote pickups are made, however, technicians may work out of doors at some distance from the studios, under less favorable conditions.

Sources of Additional Information

For information about radiotelephone operator's examinations, and guides to study for them, write to:

Federal Communications Commission, Washington, D.C. 20036.

For information on careers for broadcast technicians, write to:

National Association of Broadcasters, 1771 N St. NW., Washington, D.C. 20036.

Corporation for Public Broadcasting, 888 16th St. NW., Washington, D.C. 20006.

DRAFTERS

(D.O.T. 001.281, 002.281, 003.281, 005.281, 007.281, 010.281, 014.281, and 017.)

Nature of the Work

When making a space capsule, television set, building, or bridge, workers follow drawings that show the exact dimensions and specifications of the entire object and each of its parts. Workers who draw these plans are drafters.

Drafters prepare detailed drawings based on rough sketches, specifications, and calulations made by engineers, architects, and designers. They also calculate the strength, quality, quantity, and cost of materials. Final drawings contain a detailed view of the object as well as specifications for materials to be used, procedures followed, and other information to carry out the job.

In preparing drawings, drafters use compasses, dividers, protractors, triangles, and machines that combine the functions of several devices. They also use engineering handbooks, tables, and slide rules to help solve technical problems.

Drafters are classified according to the work they do or their level of responsibility. *Senior drafters* translate an engineer's or architect's

Drafter prepares final specifications for highway project.

preliminary plans into design "layouts" (scale drawings of the object to be built). *Detailers* draw each part shown on the layout, and give dimensions, materials, and other information to make the detailed drawing clear and complete. *Checkers* carefully examine drawings for errors in computing or recording dimensions and specifications. Under the supervision of drafters, *tracers* make minor corrections and trace drawings for reproduction on paper or plastic film.

Drafters may specialize in a particular field of work, such as mechanical, electrical, electronic, aeronautical, structural, or architectural drafting.

Places of Employment

About 313,000 persons—8 percent of them women—worked as drafters in 1974. More than 9 out of 10 drafters worked in private industry, with engineering and architectural firms employing almost 30 percent of all drafters. Other major employers included the fabricated metals, electrical equipment, and construction industries.

About 20,000 drafters worked for Federal, State, and local governments in 1974. Most drafters in the Federal Government worked for the Defense Department; th e in State and local governments were mainly in highway and public works departments. Another several thousand drafters worked for colleges and universities and nonprofit organizations.

Training, Other Qualifications, and Advancement

Persons interested in becoming drafters can acquire the necessary training in technical institutes, junior and community colleges, extension divisions of universities, and vocational and technical high schools. It is also possible to qualify through on-the-job training programs combined with part-time schooling or 3- to 4-year apprenticeship programs.

Training for a career in drafting, whether in a high school or post-high school program, should include courses in mathematics, physical sciences, mechanical drawing, and drafting. Shop practices and shop skills also are helpful since many higher level drafting jobs require knowledge of manufacturing or construction methods. Many technical schools offer courses in structural design, strength of materials, and metal technology.

Those planning careers in drafting should be able to do detailed work requiring a high degree of accuracy; have good eyesight and eye-hand coordination because most of their work is done at the drawing board; be able to function as part of a team since they work directly with engineers, architects, and skilled workers; and be able to do freehand drawings of three-dimensional objects. Artistic ability is helpful in some specialized fields.

High school graduates usually start out as tracers. Those having post-high school technical training usually qualify as junior drafters. After gaining experience, they may advance to checkers, detailers, senior drafters, or supervisors. Some may become independent designers. Courses in engineering and mathematics sometimes enable drafters to transfer to engineering positions.

Employment Outlook

Employment of drafters is expected to increase faster than the average for all occupations. This growth, along with the need to replace those who retire, die, or move into other fields of work, should provide favorable job opportunities through the mid-1980's.

Holders of an associate (2-year) degree in drafting will have the best prospects. Many large employers already require post-secondary technical education, though well-qualified high school graduates who have studied drafting will find opportunities in some types of jobs.

Employment of drafters is expected to rise rapidly as a result of the increasingly complex design problems of modern products and processes. In addition, more drafters will be needed as supporting personnel for engineering and scientific occupations. Photoreproduction of drawings and expanding use of electronic drafting equipment and computers, however, will reduce the need for less skilled drafters.

Earnings

In private industry, beginning drafters earned between $560 and $740 a month in 1974; more experienced drafters earned from $700 to $900 a month. Senior drafters averaged roughly $1,000 a month, about one and one-half times as much as the average earnings of nonsupervisory workers in private industry, except farming.

The Federal Government paid drafters having an associate degree starting salaries of $7,596 a year in late 1974. Those with less education and experience generally started at $6,764. The average Federal Government salary for all drafters was $10,400 a year.

Sources of Additional Information

General information on careers for drafters is available from:

American Institute for Design and Drafting, 3119 Price Rd., Bartlesville, Okla. 74003.

International Federation of Professional and Technical Engineers, 1126 16th St. NW., Washington, D.C. 20036.

See Sources of Additional Information in the statement on Engineering and Science Technicians elsewhere in the *Handbook*.

ENGINEERING AND SCIENCE TECHNICIANS

(D.O.T. 002. through 029.)

Nature of the Work

Knowledge of science, mathematics, industrial machinery, and processes enables engineering and science technicians to work in all phases of production, from research and design to manufacturing, sales, and customer service. Although their jobs are more limited in scope and more practically oriented than those of engineers or scientists, technicians often do work that engineers or scientists might otherwise have to do. Technicians frequently use complex electronic and mechanical instruments, experimental laboratory equipment, and drafting instruments. Almost all technicians described in this statement must be able to use engineering handbooks and computing devices such as slide rules and calculating machines.

In research and development (R&D), one of the largest areas of employment, technicians set up, calibrate, and operate complex instruments, analyze data, and conduct tests. They also assist engineers and scientists in developing experimental equipment and models by making drawings and sketches; and under an engineer's direction they frequently do routine design work.

In production, technicians usually follow the plans and general directions of engineers and scientists, but often without close supervision. They may prepare specifications for materials, devise tests to insure product quality, or study ways to improve the efficiency of an operation. They often supervise production workers to make sure they follow prescribed plans and procedures. As a product is built, technicians check to see that specifications are followed, keep engineers and scientists informed as to progress, and investigate production problems.

As sales workers or field representatives for manufacturers, technicians give advice on installation and maintenance problems of complex machinery, and may write specifications and technical manuals. (See statement on Technical Writers elsewhere in the *Handbook*.)

Technicians may work in the engineering field, in physical science, or in life science. Within these general fields, job titles may describe the level (biological aid or biological technician), duties (quality control technician or time study analyst), or area of work (mechanical, electrical, or chemical).

As an engineering technician, one might work in any of the following areas:

Aeronautical Technology. Technicians in this area work with engineers and scientists to design and produce aircraft, rockets, guided missiles, and spacecraft. Many aid engineers in preparing design layouts and models of structures, control systems, or equipment installations by collecting information, making computations, and performing laboratory tests. For example, under the direction of an engineer, a technician might estimate weight factors, centers of gravity, and other items affecting load capacity of an airplane or missile. Other technicians prepare or check drawings for technical accuracy, practicability, and economy.

Aeronautical technicians frequently work as manufacturers' field service representatives, serving as the link between their company and the military services, commercial airlines, and other customers. Technicians also prepare technical information for

instruction manuals, bulletins, catalogs, and other literature. (See statements on Aerospace Engineers, Airplane Mechanics, and Occupations in Aircraft, Missile and Spacecraft Manufacturing elsewhere in the *Handbook*.)

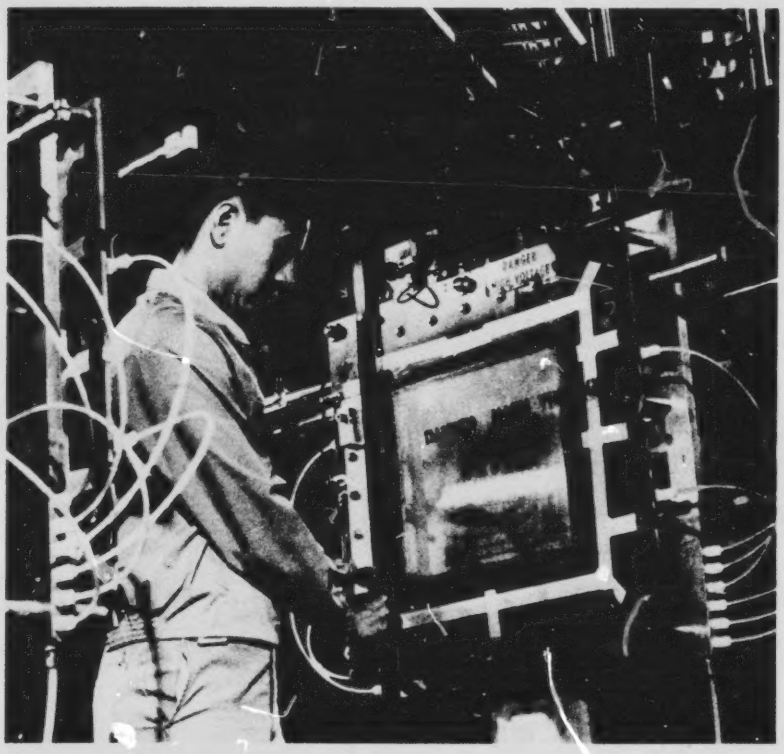
Air-Conditioning, Heating, and Refrigeration Technology. Air conditioning, heating, and refrigeration technicians design, manufacture, sell, and service equipment to regulate interior temperatures. Technicians in this field often specialize in one area, such as refrigeration, and sometimes in a particular type of activity, such as research and development.

When working for firms that manufacture temperature controlling equipment, technicians generally work in research and engineering departments, where they assist engineers and scientists in the design and testing of new equipment or production methods. For example, a technician may construct an experimental model to test its durability and operating characteristics. Technicians also work as field salesworkers for equipment manufacturers or dealers, and must be able to supply engineering firms and other contractors that design and install systems with information on installation, maintenance, operating costs, and the performance specifications of the equipment. Other technicians work for contractors, where they help design and prepare installation instructions for air-conditioning, heating, or refrigeration systems. Still others work in customer service, and are responsible for supervising the installation and maintenance of equipment. (See statement on Refrigeration and Air-Conditioning Mechanics elsewhere in the *Handbook*.)

Civil Engineering Technology. Technicians in this area assist civil engineers in planning, designing, and constructing highways, bridges, dams, and other structures. During the planning stage, they help estimate costs, prepare specifications for materials, or participate in surveying, drafting, or designing. Once construction begins, they assist the contractor or superintendent in scheduling construction activities or inspecting the work to assure conformance to blueprints and specifications. (See statements on Civil Engineers, Drafters, and Surveyors elsewhere in the *Handbook*.)

Electronics Technology. Technicians in this field develop, manufacture, and service a wide range of electronic equipment and systems. They may work with radio, radar, sonar, television, and other communication equipment, industrial and medical measuring or control devices, navigational equipment, electronic computers, and many other types of electronic equipment. Because the field is so broad, technicians often specialize in one area such as automatic control devices or electronic amplifiers. Furthermore, technological advancement is constantly opening up new areas of work. For example, the development of printed circuits stimulated the growth of miniaturized electronic systems.

When working in design, production, or customer service, electronic technicians use sophisticated measuring and diagnostic devices to analyze and test equipment. In many cases, they must understand the requirements of the field in which the electronic device is being used. In designing equipment for space exploration, for example, they must consider the need for minimum weight and volume and maximum resistance to shock, extreme temperature, and pressure. Some electronics technicians also work in technical sales, while others



Physics technician adjusts spark chamber during research experiment.

work in the radio and television broadcasting industry. (See statements on Broadcast Technicians and Occupations in Radio and Television Broadcasting elsewhere in the *Handbook*.)

Industrial Production Technology. Technicians in this area, usually called industrial or production technicians, assist industrial engineers on problems involving the efficient use of personnel, materials, and machines to produce goods and services. They prepare layouts of machinery and equipment, plan the flow of work, make statistical studies, and analyze production costs. Industrial technicians also conduct time and motion studies (analyze the time and movements a worker needs to accomplish a task) to improve the efficiency of an operation.

Many industrial technicians acquire work experience which enables them to qualify for other jobs. For example, those specializing in machinery and production methods may move into industrial safety. Others, in job analysis, may set job standards and interview, test, hire, and train personnel. Still others may move into production supervision. (See statements on Personnel Workers and Industrial Engineers elsewhere in the *Handbook*.)

Mechanical Technology. Mechanical technology is a broad term which covers a large number of specialized fields including automotive technology, diesel technology, tool design, machine design, and production technology.

Technicians assist engineers in design and development work by making freehand sketches and rough layouts of proposed machinery and other equipment and parts. This work requires knowledge of mechanical principles involving tolerance, stress, strain, friction, and vibration factors. Technicians also analyze the costs and practical value of designs.

In planning and testing experimental machines and equipment for performance, durability, and efficiency, technicians record data, make computations, plot graphs, analyze results, and write reports. They sometimes recommend design changes to improve performance. Their job often requires skill in the use of instruments, test equipment and gauges, as well as in the preparation and interpretation of drawings.

When a product is ready for production, technicians help prepare layouts and drawings of the assembly process and of parts to be manufactured. They frequently help estimate labor costs, equipment life, and plant space. Some mechanical technicians test and inspect machines and equipment in manufacturing departments or work with engineers to eliminate production problems. Others are technical salesworkers.

Tool designers are among the better known specialists in mechanical engineering technology. Tool designers design tools and devices for mass production, and frequently redesign existing tools to improve their efficiency. They prepare sketches of the designs for cutting tools, jigs, dies, special fixtures, and other attachments used in machine operations. They also make or supervise others in making detailed drawings of tools and fixtures.

Machine drafting, with some designing, is another major area often grouped under mechanical technology and is described in the statement on Drafters. (Also see statements on Mechanical Engineers, Automobile Mechanics, Manufacturers' Salesworkers, and Diesel Mechanics elsewhere in the *Handbook*.)

Instrumentation Technology. Automated manufacturing and industrial processes, oceanographic and space exploration, weather forecasting, satellite communication systems, environmental protection, and medical research have helped to make instrumentation technology a fastgrowing field for technicians. They help develop and design complex measuring and control devices such as those in a spacecraft that sense and measure changes in heat or pressure, automatically record data, and make necessary adjustments. These technicians have extensive knowledge of physical sciences as well as electrical-electronic and mechanical engineering. (See statement on Instrument Workers elsewhere in the *Handbook*.)

Several areas of opportunity exist in the physical sciences:

Chemical technicians work with chemists and chemical engineers to develop, sell, and utilize chemical and related products and equipment.

Most chemical technicians do research and development, testing, or other laboratory work. They often set up and conduct tests on processes and products being developed or improved. For example, a technician may examine steel for carbon, phosphorous, and sulfur content or test a lubricating oil by subjecting it to changing temperatures. The technician measures reactions, analyzes the results of experiments, and records data which will be the basis for decisions and future research.

Chemical technicians in production generally put into commercial operation those products or processes developed in research laboratories. They assist in making the final design, installing equipment, and training and supervising operators on the production line. Technicians in quality control test materials, production processes, and final products to insure that they meet the manufacturer's specifications and quality standards. Many also work as technical sales personnel, selling chemicals or chemical products.

Many chemical technicians use computers and instruments, such as a dilatometer (which measures the expansion of a substance). Because the field of chemistry is so broad, chemical technicians frequently specialize in a particular industry such as food processing or pharmaceuticals. (See statements on Chemists, Chemical Engineers, and Occupations in the Industrial Chemical Industry elsewhere in the *Handbook*.)

Meteorological technicians support meteorologists in the study of atmospheric conditions. Technicians calibrate instruments, observe, record, and report meteorological occurrences, and assist in research projects and the development of scientific instruments.

Geological technicians assist geologists in evaluating earth processes. Currently much research is being conducted in seismology, petroleum and mineral exploration, and ecology. These technicians install seismographic instruments, record measurements from these instruments, assist in field evaluation of earthquake damage and surface displacement, or assist geologists in earthquake prediction research. In petroleum and mineral exploration, they help conduct tests and record sound wave data to determine the likelihood of successful drilling, or use radiation detection instruments and collect core samples to help geologists evaluate the economic possibilities of mining a given resource.

Hydrologic technicians gather data to help professional hydrologists predict river stages and water quality levels. They monitor instruments which measure water flow, water table levels, or water quality, they analyze these data and report their findings to the hydrologist. (See statement on Environmental Scientists elsewhere in the *Handbook*.)

Technician positions in the life sciences are generally included in two categories: *Agricultural technicians* work with agricultural scientists in the areas of food production and processing. Plant technicians conduct tests and experiments to improve the yield and quality of crops, or to increase resistance to disease, insects, or other hazards. Technicians in soil science analyse the chemical and physical properties of various soils to help determine the best uses for these soils. Animal husbandry technicians concern themselves mainly with the breeding and nutrition of animals. In addition, several thousand technicians work in the food industry as food processing technicians. They work in quality control or in food science research, helping food scientists develop better and more efficient ways of processing food material for human consumption. (See statement on Food Scientists elsewhere in the *Handbook*.)

Biological technicians work primarily in laboratories where they perform tests and experiments under controlled conditions. Microbiological technicians study microscopic organisms and may be involved in immunology or parasitology research. Laboratory animal technicians study and report on the reaction of laboratory animals to certain physical and chemical stimuli. They also study and conduct research to help biologists develop cures which may be applied to human diseases.

Biochemical technicians assist biochemists in the chemical analysis of biological substances (blood, other body fluids, foods, drugs). Most of their work involves conducting experiments and reporting their results to a biochemist. As a biological technician, one might also work primarily with insects, studying insect control, developing new insecticides, or determining how to use insects to control other insects or undesirable plants. (See statements on Life Scientists elsewhere in the *Handbook*.)

Technicians also specialize in fields such as metallurgical (metal), electrical, and optical technology. In the atomic energy field, technicians work with scientists and engineers on problems of radiation safety, inspection, and decontamination. (See statement on Occupations in the Atomic Energy Field elsewhere in the *Handbook*.) New areas of work include environmental protection, where technicians study the problems of air and water pollution, as well as the field of industrial safety.

Agricultural technician extracts grain sample for lab test.

Places of Employment

Over 560,000 persons worked as engineering and science technicians in 1974. Almost 390,000 worked in engineering fields, about 125,000 in the physical science occupations, and about 50,000 in the life sciences. About 13 percent of all engineering and science technicians were women. The proportion of women technicians, by field, was 30 percent in life science; 15 percent in physical science; and 5 percent in engineering.

More than 375,000 (about 2 out of 3) technicians worked in private industry. In the manufacturing sector, the largest employers were the electrical equipment, chemicals,

machinery, and aerospace industries. In nonmanufacturing, large numbers worked in wholesale and retail trade, communications, and in engineering and architectural firms.

In 1974, the Federal Government employed about 87,000 technicians, chiefly as engineering aids and technicians, equipment specialists, biological technicians, cartographic technicians (mapmaking), meteorological technicians, and physical science technicians. The largest number worked for the Department of Defense; most of the others worked for the Departments of Transportation, Agriculture, Interior, and Commerce.

State government agencies employed nearly 50,000 engineering and science technicians, and local governments about 11,000. The remainder worked for colleges and universities and nonprofit organizations.

Training, Other Qualifications, and Advancement

Persons can qualify for technician jobs through many combinations of work experience and education because employers traditionally have been flexible in their hiring standards. However, most employers prefer applicants who have had some specialized technical training. Specialized training is available at technical institutes, junior and community colleges, area vocational-technical schools, extension divisions of colleges and universities, and vocational-technical high schools. Engineering and science students who have not completed the bachelor's degree and others who have degrees in science and mathematics also are able to qualify for technician positions.

Persons can also qualify for technician jobs by less formal methods. Workers may learn through on-the-job training programs or courses in post-secondary or correspondence schools. Some qualify on the basis of experience gained in the Armed Forces. However, post-secondary training is increasingly necessary for advancement to more responsible jobs.

Some of the types of post-secondary and other schools which provide technical training are discussed in the following paragraphs:

Technical Institutes. Technical institutes offer training to qualify students for a job immediately after graduation with a minimum of on-the-job training. In general, students receive intensive technical training but less theory and general education than in engineering schools or liberal arts colleges. A few technical institutes and community colleges offer cooperative programs; students spend part of the time in school and part in paid employment related to their studies.

Some technical institutes operate as regular or extension divisions of colleges and universities. Other institutions are operated by States and municipalities, or by private organizations.

Junior and Community Colleges. Curriculums in junior and community colleges which prepare students for technician occupations are similar to those in the freshman and sophomore years of 4-year colleges. After completing the 2-year program, graduates can transfer to 4-year colleges or qualify for some technician jobs. Most large community colleges offer 2-year technical programs, and many employers prefer graduates having more specialized training.

Area Vocational-Technical Schools. These post-secondary public institutions serve students from surrounding areas and train them for jobs in the local area. Most of these schools require a high school degree or its equivalent for admission.

Other Training. Some large corporations conduct training programs and operate private schools to meet their needs for technically trained personnel in specific jobs; such training rarely includes general studies. Training for some technician occupations, for instance tool designers and electronic technicians, is available through formal 2- to 4-year apprenticeship programs. The apprentice gets on-the-job training under the close supervision of an experienced technician and related technical knowledge in classes, usually after working hours.

The Armed Forces have trained many technicians, especially in electronics. However, military job requirements are generally different from those in the civilian economy. Thus, military technician training may not be adequate for civilian technician work, and additional training may be necessary for employment.

Technician training also is available from many private technical and correspondence schools that often specialize in a single field such as electronics. Some of these schools are owned and operated by large corporations that have the resources to provide very up-to-date training in a technical field.

Those interested in a career as a technician should have an aptitude for mathematics and science, and enjoy technical work. An ability to do detailed work with a high degree of accuracy is necessary; for design work, creative talent also is desirable. Since technicians are part of a scientific team, they sometimes must work under the close supervision of engineers and scientists as well as with other technicians and skilled workers.

Engineering and science technicians usually begin work as trainees in routine positions under the direct supervision of an experienced technician, scientist, or engineer. As they gain experience, they

receive more responsibility and carry out a particular assignment under only general supervision. Technicians may eventually move into supervisory positions. Those who have the ability and obtain additional education are sometimes upgraded to professional science or engineering positions.

Employment Outlook

Employment opportunities for engineering and science technicians are expected to be favorable through the mid-1980's. Opportunities will be best for graduates of post-secondary school technician training programs. Besides the openings resulting from faster than average growth expected in this field, additional technicians will be needed to replace those who die, retire, or leave the occupation.

Industrial expansion and the increasing complexity of modern technology underlie the anticipated increase in demand for technicians. Many will be needed to work with the growing number of engineers and scientists in developing, producing, and distributing new and technically advanced products. Automation of industrial processes and growth of new work areas such as environmental protection and urban development will add to the demand for technical personnel.

The anticipated growth of research and development (R&D) expenditures in industry and government should increase demand for technicians. However, this growth is expected to be slower than in the past.

Because space and defense programs are major factors in the employment of technical personnel, expenditures in these areas affect the demand for technicians. The outlook for technicians is based on the assumption that defense spending will increase from the 1974 level by the mid-1980's, but will still be slightly lower than the levels of the late 1960's. If defense spending should differ substantially from this level, the demand for technicians would be affected accordingly.

Earnings

In general, technicians' earnings depend on their education and technical specialty, as well as their ability and work experience, and the industry in which they work.

In private industry in 1974, average starting salaries for 2-year graduates ranged from about $8,200 to $9,800 a year, while non-graduates earned average starting salaries from just over $6,000 to about $8,500. Starting salaries for bachelor's degree recipients averaged over $10,000 a year. According to a 1974 Bureau of Labor Statistics survey, experienced engineering technicians in private industry earned average salaries of about $13,500 a year.

Starting salaries for all technicians in the Federal Government were fairly uniform in late 1974. A high school graduate with no experience could expect $5,996 annually to start. With an associate degree, the starting salary was $7,596, and if a bachelor's degree were held, the annual salary might be $8,500 or $10,520 (depending on the type of job vacancy and the applicant's education and other qualifications). At higher experience levels, however, differences in earnings are significant. The average annual salary for all engineering technicians employed by the Federal Government in late 1974 was $16,000; for physical science technicians, $15,000; and for life science technicians, about $11,000.

Sources of Additional Information

For information on careers for engineering and science technicians and engineering and technology programs, contact:

Engineers Council for Professional Development, 345 East 47th St., New York, N.Y. 10017.

Information on schools offering technician programs is available from:

National Association of Trade and Technical Schools, Accrediting Commission, 2021 L St. NW., Washington, D.C. 20036.

U.S. Department of Health, Education, and Welfare, Office of Education, Washington, D.C. 20202.

State departments of education also have information about approved technical institutes, junior colleges, and other educational institutions within the State offering post-high school training for specific technical occupations. Other sources include:

American Association of Community and Junior Colleges, Suite 410, 1 Dupont Circle, Washington, D.C. 20036.

National Home Study Council, 1601 18th St. NW., Washington, D.C. 20009.

SURVEYORS

(D.O.T. 018.188)

Nature of the Work

Before engineers can plan highways or other construction projects, they need complete and accurate information about boundaries, land features, and other physical characteristics of the construction site. Surveyors measure construction sites, help establish official land boundaries, assist in setting land valuations, and collect information for maps and charts.

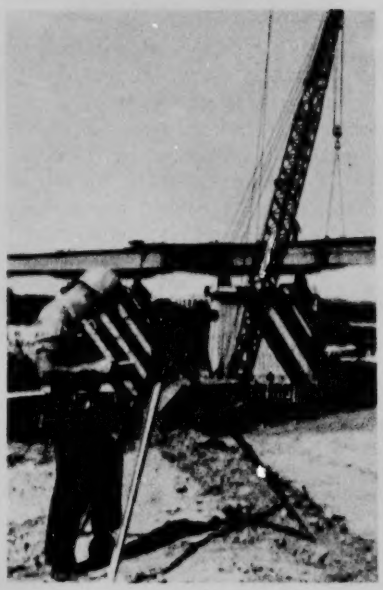
Surveyors often work as party chiefs; that is, they are in charge of a field party that determines the precise measurements and locations of elevations, points, lines, and contours on the earth's surface, and distances between points. Surveyors are directly responsible for the field party's activity and the accuracy of its work. They plan the field work, select survey reference points, and determine the precise location of natural and man-made features of the survey region. They record the information disclosed by the survey, verify the accuracy of

the survey data, and prepare sketches, maps, and reports.

A typical field party is made up of the party chief and three to six assistants and helpers. *Instrument workers* (D.O.T. 018.188) adjust and operate surveying instruments such as the theodolite (used to measure altitude). *Chain workers* (D.O.T. 018.687) use a steel tape or surveyor's chain to measure distances between surveying points. Generally chain workers operate in pairs, one holding the tape at the last established point, and the other marking an advanced measuring point. Chain workers also may mark measured points with painted stakes. *Rod workers* (D.O.T. 018.587) use a level rod, range pole, or other equipment to assist instrument workers in determining elevations, distances, and directions. They hold and move the range pole according to hand or verbal signals of the instrument worker to help establish the exact point of measurement. Rod workers also may clear brush from the survey line.

Surveyors often specialize in a particular type of survey. Besides doing *highway surveys*, many perform *land surveys* and locate boundaries of a particular tract of land. They then prepare maps and legal descriptions for deeds, leases, and other documents. Surveyors doing *topographic surveys* determine elevations, depressions, and contours of an area, and indicate the location of distinguishing surface features such as farms, buildings, forests, roads, and rivers.

Several closely related occupations are geodesy and photogrammetry. Geodesists measure immense areas of land, sea, or space by taking into account the earth's curvature and its geophysical characteristics. (See statement on Geophysicists elsewhere in the *Handbook*.) Photogrammetrists measure and interpret natural or man-made features of an area. They make topographic and thematic



Surveyor checks topography at construction site.

maps by applying analytical processes and mathematical techniques to photographs obtained from aerial, space, and ground surveys. Control surveys on the ground are made to determine the accuracy of maps derived from photogrammatic techniques.

Places of Employment

About 55,000 people worked as surveyors in 1974; less than 5 percent were women. Federal, State, and local government agencies employ about one-third of all surveyors. Among the Federal Government agencies employing these workers are the U.S. Geological Survey, the Bureau of Land Management, the Army Corps of Engineers, and the Forest Service. Most surveyors in State and local government agencies work for highway departments and urban planning and redevelopment agencies.

A large number of surveyors work for construction companies and for engineering and architectural consulting firms. A sizable number either work for or own firms that conduct surveys for a fee. Significant numbers of surveyors also work for crude petroleum and natural gas companies, and for public utilities.

Training, Other Qualifications, and Advancement

A combination of post-secondary school courses in surveying and extensive on-the-job training is the most common method of entering surveying work. Junior colleges, technical institutes, and vocational schools offer 1-, 2-, and 3-year programs in surveying. A few 4-year colleges offer bachelor's degrees specifically in surveying, while many offer several courses in the field. Most surveying programs admit only high school graduates, preferably those who have studied algebra, geometry, trigonometry, calculus, drafting, and mechanical drawing. With some post-secondary school courses in surveying, beginners can generally start as instrument workers. After gaining experience, they usually advance to party chief, and may later seek to become a registered surveyor. In many instances, promotions to higher level positions are based on written examinations as well as experience.

High school graduates with no formal training in surveying usually start as rod workers. After several years of on-the-job experience and some formal training in surveying, it is possible to advance to chain worker, instrument worker, and finally to party chief.

For those interested in a professional career in photogrammetry, a bachelor's degree in engineering or the physical sciences is usually needed.

All 50 States require licensing or registration of land surveyors responsible for locating and describing land boundaries. Registration requirements are generally quite strict, because once re-

gistered, surveyors can be held legally responsible for their work. In some States, applicants for licenses need to know other types of surveying in addition to land surveying. Requirements vary among the States but in general they include a combination of 4 to 8 years' experience in surveying and passing an examination. Most States reduce the experience needed to take the licensing examination if the applicant has taken post-secondary courses in surveying.

In 1974, about 20,000 land surveyors were registered. In addition, about 13,000 engineers were registered to do land surveying, primarily as part of their civil engineering duties; however, these workers are considered engineers rather than surveyors. (See statement on Civil Engineers elsewhere in the *Handbook*.)

Qualifications for success as a surveyor include ability to visualize objects, distances, sizes, and other abstract forms and to make mathematical calculations quickly and accurately. Leadership qualities also are important as surveyors must supervise the work of others.

Members of a survey party must be strong and healthy in order to work outdoors and carry equipment over difficult terrain. They also need good eyesight, coordination, and hearing in order to communicate over great distances by hand signals or voice calls.

Employment Outlook

Employment opportunities for surveyors are expected to be favorable through the mid-1980's, especially for those with postsecondary school training. Employment of surveyors is expected to grow much faster than the average for all occupations through the mid-1980's. In addition to the openings resulting from growth, many will result from the need to replace those who die, retire, or transfer to other fields of work.

The rapid development of urban areas and increased land values should create jobs for surveyors to locate boundaries for property records. Others will be needed to lay out streets, shopping centers, schools, and recreation areas. Construction and improvement of the Nation's roads and highways also will require many new surveyors.

Earnings and Working Conditions

In the Federal Government in late 1974, high school graduates with little or no training or experience started as rod workers or chain workers with an annual salary of $5,996. Those with 1 year of related post-secondary training earned $6,764. Those with an associate degree which included courses in surveying generally started as instrument workers with an annual salary of $7,596. The majority of surveyors who worked as party chiefs in the Federal Government earned between $9,500 and $13,000 per year and some surveyors in high-level positions earned more than $15,000 per year.

Although salaries in private industry vary by geographic area, limited data indicate that salaries are generally comparable to those in Federal service and are above the average earnings of nonsupervisory workers in private industry, except farming.

Surveyors usually work an 8-hour, 5-day week. However, they sometimes work longer hours during the summer months when weather conditions are most suitable for surveying. The work of surveyors is active and sometimes strenuous. They often stand for long periods and walk long distances or climb mountains with heavy packs of instruments and equipment. Because most work is out-of-doors, surveyors are exposed to all types of weather. Some duties, such as planning surveys, preparing reports and computations, and drawing maps, usually are done in an office.

Sources of Additional Information

Information about training and career opportunities in surveying is available from:

American Congress on Surveying and Mapping, Woodward Building, 733 15th St. NW., Washington, D.C. 20005.

General information on careers in photogrammetry is available from:

American Society of Photogrammetry, 150 North Virginia Ave., Falls Church, Va. 22046.

MECHANICS AND REPAIRERS

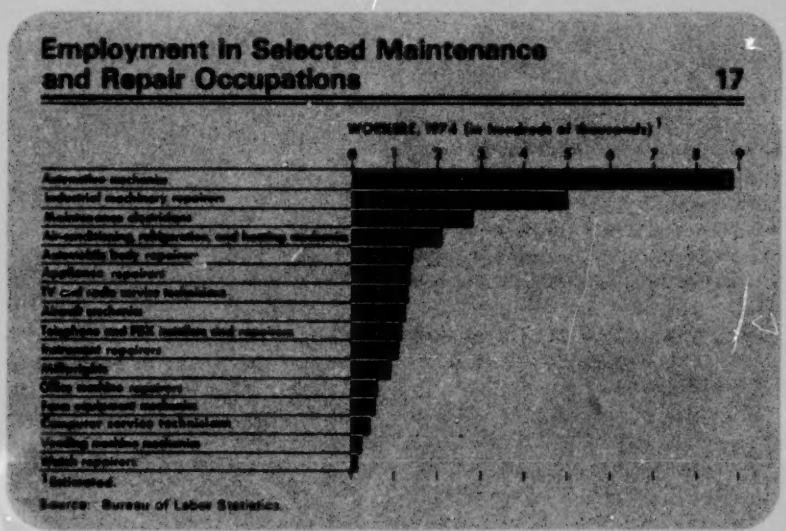
Mechanics and repairers—the workers who keep our automobiles, airplanes, household appliances, and other machinery operating properly—make up one of the fastest growing groups of skilled workers in the Nation's labor force. This occupational field offers many career opportunities to people who are mechanically inclined and are willing to invest a few years in learning a trade.

Nearly 3 million people worked as mechanics and repairers in 1974. More than one-third were automotive mechanics, such as automobile mechanics, truck or bus mechanics, and automobile body repairers. Some other large occupations—each employing more than 100,000 workers—were appliance repairers, industrial machinery repairers, airplane mechanics, and television and radio service technicians. Employment in some occupations, including those of vending machine mechanic, electric sign repairer, and locksmith, was relatively small.

In addition to the nearly 3 million mechanics and repairers employed in 1974, over 700,000 people worked in three related occupations: maintenance electrician, telephone craft worker, and watch repairer. Altogether these 3.7 million maintenance and repair workers represented about 1 out of every 3 skilled workers.

Over one-fourth of the mechanics and repairers worked in manufacturing industries, and the majority of these were in plants that produce durable goods such as steel, automobiles, and aircraft. About one-fifth of the mechanics and repairers worked in retail trade—mainly in firms that sell and service automobiles, household appliances, farm implements, and other mechanical equipment. Another one-fifth worked in shops that service such equipment. Most of the remaining mechanics and repairers worked for transportation, construction, and public utilities industries, and all levels of government.

Mechanics and repairers work in every section of the country. Most employment opportunities, however, are in the populous and industrialized States.



Training, Other Qualifications, and Advancement

Many mechanics and repairers learn their skills on the job or through apprenticeship training. Some acquire basic training or increase their skills in vocational and technical schools. Others take correspondence courses. Training and experience in the Armed Forces also may help people prepare for occupations such as airplane mechanic and television and radio service technician.

Most employers consider a 3- to 4-year apprenticeship, supplemented each year by at least 144 hours of related classroom instruction, as the best way to learn skilled maintenance and repair work. Formal apprenticeship agreements are registered with a State apprenticeship agency or the U.S. Department of Labor's Bureau of Apprenticeship and Training.

Employers look for applicants who have mechanical aptitude and

like to work with their hands. Many employers prefer people whose hobbies or interests include automobile repair, model building, or radio and television repair. A high school education often is required, and employers generally prefer applicants who have had courses in mathematics, chemistry, physics, blueprint reading, and machine shop.

Physical requirements for work in this field vary greatly. For example, telephone lineworkers should be strong and agile, to climb poles, lift heavy equipment, and work in awkward positions. On the other hand, instrument and watch repairers need patience, finger dexterity, and good vision.

Many maintenance and repair workers advance to supervisory jobs; others to sales or technician jobs. Many open their own businesses.

Employment Outlook

Employment in maintenance and repair occupations as a whole is expected to increase faster than the average for all occupations through the mid-1980's. In addition to jobs created by employment growth, openings will arise as experienced workers retire, die, or transfer to other fields.

Many factors are expected to contribute to the growing need for mechanics and repairers, including increased demand for household appliances, automobiles, and other items, and repair of complex machinery in industry.

This chapter includes statements on many maintenance and repair occupations. Other maintenance and repair workers are discussed in other sections of the *Handbook*. For example, airplane mechanics are discussed with Air Transportation Occupations and millwrights with Industrial Production and Related Occupations.

TELEPHONE CRAFT OCCUPATIONS

About 1 out of every 3 employees in the telephone industry is a craft worker who installs, repairs, and maintains phones, cables, and related equipment. This chapter discusses the four groups of telephone craft occupations: central office craft occupations, central office equipment installers, line installers and cable splicers, and telephone installers and repairers.

CENTRAL OFFICE CRAFT OCCUPATIONS

Nature of the Work

Telephone companies employed about 110,000 craft workers in 1974 to maintain and repair the complex equipment in their central offices. Most worked as frame wirers, repairers, and trouble locators.

Frame wirers (D.O.T. 822.884) connect and disconnect wires that run from telephone lines and cables to equipment in central offices.

Frame wirer makes connection for new telephone.

Connections are made by soldering wires to terminal lugs. They make these changes when new phones are installed, existing ones are removed, or numbers are changed. *Central office repairers* (D.O.T. 822.281) maintain the switching equipment that automatically connects lines when customers dial numbers. *Trouble locators* (D.O.T. 822.381) work at special switchboards to find and analyze trouble spots reported on customers' lines. They also work with other employees, such as central office repairers and cable splicers, who help find the cause of trouble and make repairs.

Training, Other Qualifications, and Advancement

Telephone companies give classroom instruction and on-the-job training to new central office craft employees. Often classrooms are supplied with equipment similar to that which the trainee will be using on the job. Trainee jobs generally are filled by employees already with the company, such as telephone operators, and occasionally by workers hired from outside Usually, trainees are assigned to the starting job of frame wirer, and take basic courses in telephone communications. They gain practical experience by observing and helping experienced frame wirers under the direction of supervisors. With additional training and experience, a frame wirer can advance to central office repairer or trouble locator. At least 5 years usually are necessary for an inexperienced worker to advance to the top pay rate in either of these two jobs.

Since electrical wires are usually color coded, persons who are considering careers in central office crafts should have good eyesight—no color blindness. They also should be able to work closely with others because teamwork often is essential in solving complex maintenance problems. A basic knowledge of electricity and electronics and telephone training in the armed services are helpful.

Telephone companies give central office craft employees continued training throughout their careers to keep them abreast of the latest developments. As new types of equipment and tools and new maintenance methods are introduced, employees are sent to schools for courses of varying duration.

Central office craft workers who have managerial ability can advance to supervisory positions.

Employment Outlook

Employment in central office craft occupations is expected to increase about as fast as the average for all occupations through the mid-1980's. Many new central offices will be built to meet increased demand for telephone services. As population grows and becomes more mobile, a greater demand for telephone installations and removals will result in employment growth for frame wirers, trouble locators, and central office repairers. Additional employment growth for trouble locators and central office repairers will result from the use of increasingly complex equipment which requires more maintenance

In addition to employment growth, many job openings will arise to replace experienced workers who retire, die, or transfer to other occupations. Retirements and deaths alone may result in several thousand openings each year. Although most job openings are

filled by the advancement of operators and other workers already employed by telephone companies, some trainee positions as frame wirers should be available for new employees. Most job openings will be in metropolitan areas.

Earnings and Working Conditions

In 1974, average hourly rates were $6.29 for trouble locators and $6 for central office repairers. By comparison, nonsupervisory workers in all private industries, except farming averaged $4.22 an hour.

Earnings increase considerably with length of service. According to a 1974 union contract in one of the higher pay scale cities, frame wirers start at $4.09 an hour and can work up to a maximum of $5.81 an hour after 4 years. Central office repairers and trouble locators can earn a maximum of $7 an hour after 5 years.

Employees in central offices work in clean and well-lighted surroundings. Since the telephone industry gives continuous service to its customers, central offices operate 24 hours a day, 7 days a week. Some central office craft workers, therefore, have work schedules for which they receive extra pay. Central office craft workers are covered by the same provisions governing overtime pay, vacations, holidays, and other benefits that apply to telephone workers generally.

See the statement on the telephone industry elsewhere in the *Handbook* for sources of additional information and for general information on fringe benefits.

CENTRAL OFFICE EQUIPMENT INSTALLERS

Nature of the Work

Central office equipment installers set up complex switching and dialing equipment in central offices of telephone companies. They assemble, wire, adjust, and test this equipment to meet manufacturer's standards for efficiency and dependability. They may install equipment in a new central office, add equipment in an expanding office, or replace outmoded equipment.

About 30,000 installers were employed in 1974. Most work for manufacturers of central office equipment. Others work directly for telephone companies or for private contractors who specialize in large-scale installations.

Many central office equipment installers are assigned to areas that include several States, and they therefore must travel frequently. When installing a switchboard in a small community, an installer may work with only one or two other installers. On large jobs, however, such as a long-distance toll center in a big city, hundreds of installers are required.

Training, Other Qualifications, and Advancement

Individuals considering careers as central office equipment installers should have good eyesight—no color blindness. They should be able to work with others, for teamwork is often essential to solving a complex problem.

New employees receive on-the-job training and classroom instruction. They attend classes the first few weeks to learn basic installation methods before starting on-the-job training. After several years of experience, they may qualify as skilled installers. Training, however, continues even after they become skilled. Additional courses are given from time to time to improve their skills and to teach new techniques in installing telephone equipment.

Installers who have managerial ability can advance to supervisory positions.

Central office equipment installers wire a new distribution frame and switching equipment.

Employment Outlook

Employment of central office equipment installers is expected to increase as fast as the average for all occupations through the mid-1980's. In addition to the job openings that will result from employment growth, a few hundred openings will arise each year to replace experienced installers who transfer to other work, retire, or die.

Employment will increase because of the need to install equipment in thousands of new telephone central offices and to replace obsolete equipment. Employment may, however, fluctuate from year to year because investment in central office equipment is subject to changes in business conditions and availability of funds. Thus, when the business outlook is depressed, there is less likelihood that new central offices will be built or that existing offices will be enlarged or have more modern equipment installed. When business is prospering, installations and modifications of central offices may occur at an above-average pace.

Earnings and Working Conditions

According to a major union con-

tract in 1974, starting rates for inexperienced installers ranged from $3.35 to $3.75 an hour. The contract provided for periodic increases, and employees could reach rates of $6.18 to $6.41 an hour after 5 years of experience. Travel and expense allowances also were provided.

The Communications Workers of America represents most central office equipment installers, including those with the Bell System. The International Brotherhood of Electrical Workers represents some installers employed by various telephone companies, by manufacturers supplying the independent segment of the telephone industry, and by large installation contractors.

See statement on the telephone industry elsewhere in the *Handbook* for sources of additional information and for general information on fringe benefits.

LINE INSTALLERS AND CABLE SPLICERS

Nature of the Work

The vast network of wires and cables that connect telephone central offices to each other and to customers' telephones and switchboards is constructed and maintained by line installers and cable splicers and their helpers. Telephone companies employed about 55,000 of these workers in 1974: 33,000 cable splicers, 15,000 line installers, and 7,000 helpers, laborers, and other workers.

To construct new telephone lines, *line installers* (D.O.T. 822.381) place wires and cables that lead from the central office to customers' premises. They use power-driven equipment to dig holes and set in telephone poles which support cables. Line installers climb the poles to attach the cables, usually leaving the ends free for cable splicers to connect later. In cities where telephone lines are below the streets, installers place cables in underground conduits. On construction jobs, installers work in crews of two persons or more. A supervisor directs the work of several crews.

When wires or cables break or a pole is knocked down, line installers are often called upon to make emergency repairs. These repairs are most common in parts of the country that have hurricanes, tornadoes, and heavy snowfalls. The line crew supervisor keeps in close contact with the central office, which directs the crew to problem locations on the lines. Some installers periodically inspect sections of lines in rural areas and make minor repairs.

After line installers place cables on poles or underground, *cable splicers* (D.O.T. 829.381) generally complete the line connections. Splicers work on poles, aerial ladders and platforms, in manholes, or in basements of large buildings. They connect individual wires within the cable and rearrange wires when lines have to be changed. At each splice, they either wrap insulation around the wires and seal the joint with a lead sleeve or cover the splice with some other type of closure. Usually, they fill the cable sheathing with compressed air to keep out moisture.

Splicers install terminal boxes on new cables. Often these boxes are placed in basements of apartment buildings. Later, a telephone installer will connect customers' telephones to the terminal box.

Splicers also maintain and repair cables. The preventive maintenance work that they do is extremely important, because a single defect in a cable may cause a serious interruption in service. Many

trouble spots are located through air pressure or electric tests.

Training, Other Qualifications, and Advancement

Telephone companies hire inexperienced workers to train for jobs as line installers or cable splicers. Knowledge of the basic principles of electricity and telephone training in the armed services are helpful. Physical examinations usually are given to prospective employees, since some line and cable work is strenuous, requiring workers to climb poles and lift lines and equipment. The ability to distinguish color also is important because wires usually are coded by color.

Telephone companies have training programs for line installers and cable splicers that include classroom instruction as well as on-the-job training. Classrooms are equipped with actual telephone apparatus, such as poles, cable supporting clamps, and other fixtures to simulate working conditions as closely as possible. Trainees learn to climb poles and are taught safe working practices to avoid falls and contact with power wires. After a short period of classroom training, some trainees are assigned to a crew to work with experienced line installers and cable splicers under the supervision of a line supervisor.

Line installers and cable splicers continue to receive training throughout their careers, to qualify for more difficult assignments and to keep up with technological changes. Those having the necessary qualifications find many additional advancement opportunities in the telephone industry. For example, a line installer may be transferred to telephone installer and later to telephone repairer or other higher rated jobs.

Employment Outlook

Employment of cable splicers is expected to show little or no change through the mid-1980's. Technological developments such as the telephone splicing van which uses the truck engine to heat and ventilate manholes and drive power tools and equipment will improve the efficiency of splicers, thus limiting the need for additional workers. Nevertheless, many job openings will arise due to the need to replace experienced splicers who retire, die, or transfer to other occupations.

Little or no change is expected in the number of line installers because the increasing use of mechanical improvements, such as plows that can dig a trench, lay cable, and cover it in a single operation, have eliminated much of the heavier physical work of the line crews and have caused reductions in crew size. Also, satellites are expected to carry an increasing volume of telephone traffic, thus slightly reducing the emphasis on cable installation. Some job openings will occur, however, as experienced line installers retire, die, or transfer to other occupations.

Due to the many miles of cable which must be installed and maintained in rural areas, job openings for line installers and cable splicers may be easier to find in small cities than in metropolitan areas.

Earnings and Working Conditions

In 1974, wage rates of cable splicers averaged $5.85 an hour and line installers averaged $5.02. By comparison, nonsupervisory workers in all private industries, except farming, averaged $4.22 an hour.

Pay rates for cable splicers and line installers depend to a considerable extent upon length of service and geographic location. For example, according to a 1974 union contract, new workers in line construction jobs in one of the higher pay scale cities began at $4.11 an hour. Line installers could reach a maximum of $6.91 after 5 years of service. The maximum hourly rate for cable splicers was $7. Line installers and cable splicers are covered by the same contract provisions governing overtime pay, vacations, holidays, and other benefits that apply to telephone workers generally.

Line installers and cable splicers work outdoors. They must do considerable climbing, and often work in stooped and cramped positions. Safety standards, developed over the years by telephone companies with the cooperation of labor unions, have greatly reduced the hazards of these occupations. When severe weather damages telephone lines, line installers and cable splicers may be called upon to work long and irregular hours to restore service. Because of the physical demands of the work, some line installers and cable splicers, by the time they reach their mid-fifties, transfer to other jobs such as telephone installers and repairers or central office craft occupations.

See the statement on the telephone industry elsewhere in the *Handbook*, for sources of additional information and for general information on fringe benefits.

TELEPHONE AND PBX INSTALLERS AND REPAIRERS

Nature of the Work

Telephone installers and repairers are the largest group of telephone craft workers; about 115,000 were employed in 1974. They install and service telephones and switchboard systems such as PBX and CENTREX on the customers' property and make repairs on the equipment when trouble develops. These workers generally travel to customers' homes and offices in trucks equipped with telephone tools and supplies. When customers move or

request new types of service, they relocate telephones or make changes on existing equipment. For example, they may install a switchboard in an office, or change a two-party line to a single-party line in a residence. Installers also may fill a customer's request to add an extension in another room, or to replace an old telephone with a new model. Although some installers and repairers do a variety of work, most specialize in one or two jobs described below.

Telephone installers (D.O.T. 822.381) install and remove telephones in homes and business places. They connect telephones to outside service wires and sometimes must climb poles to make these connections. Occasionally, especially in apartment buildings, the service wires or terminals are in the basement of the building in which the installation or removal is being done. Telephone installers are sometimes called station installers.

PBX installers (D.O.T. 822.381) perform the same duties as telephone installers, but they specialize in more complex telephone system installations. They connect wires from terminals to switchboards and make tests to check their installations. Some PBX installers also set up equipment for radio and television broadcasts, mobile radiotelephones, and data processing equipment.

Employment of telephone installers will increase due to the growing demand for telephones.

Telephone repairers (D.O.T. 822.281), with the assistance of trouble locators in the central office, locate trouble on customers' equipment and make repairs to restore service.

PBX repairers (D.O.T. 822.281), with the assistance of trouble locators, locate trouble on customers' PBX, CENTREX, or other complex telephone systems and make the necessary repairs. They also maintain associated equipment such as batteries, relays, and power plants. Some PBX repairers maintain and repair equipment for radio and television broadcasts, mobile radiotelephones, and data processing equipment.

Training, Other Qualifications, and Advancement

Telephone companies give new service workers classroom instruction and on-the-job training. They train inexperienced people as well as their own employees, such as telephone operators, for telephone installation and repair jobs. Applicants need good eyesight—no color blindness. Tests are given to help determine the applicant's aptitude for the work. Companies train experienced employees, such as telephone installers and repairers and cable splicers, for PBX installation and repair work.

Classroom training usually is designed to simulate actual working conditions. For example, telephone installer trainees are instructed in classrooms equipped with telephone poles, lines and cables, terminal boxes, and other equipment. They practice installing telephones and connecting wires just as they would in the field. After a few weeks in the classroom, trainees are assigned to the field for on-the-job training by experienced workers, often supervisors.

Telephone service workers continue to receive training throughout their careers, to qualify for more responsible assignments and to keep up with technical changes. Those who have managerial ability can advance to supervisory jobs.

Employment Outlook

Employment of telephone installers and repairers is expected to increase slower than the average for all occupations through the mid-1980's. Most job openings will result from employment growth, but many openings will arise to replace workers who retire, die, or transfer to other occupations. These openings are usually filled by workers from other telephone jobs, such as operators, service representatives, line installers, or cable splicers, but some should be available to new employees.

Employment will increase due to the growing demand for telephones and PBX and CENTREX systems. Employment of installers will increase most rapidly in cities where the population is growing rapidly, thus creating a large demand for telephone installations. Also, cities that have a large influx or outflow of people, such as those with military bases nearby, will have a relatively large demand for telephone installations and removals.

Earnings and Working Conditions

In 1974, the average hourly rate for PBX repairers was $6.13 and the average for telephone and PBX installers was $5.75. In comparison, nonsupervisory workers in all private industries, except farming, had average earnings of $4.22 an hour.

Earnings increase considerably with length of service. According to a 1974 union contract in one of the

higher pay scale cities, telephone installers and repairers have a starting rate of $4.11 an hour, with periodic pay increases until a maximum of $6.91 an hour is reached after 5 years. Installers and repairers are covered by the same provisions governing overtime pay, vacations, holidays, and other benefits that apply to telephone workers generally.

Telephone installers and repairers work indoors and outdoors in all kinds of weather. They may work extra hours when breakdowns occur in lines or equipment.

(See the statement on the telephone industry elsewhere in the *Handbook* for sources of additional information and for general information on fringe benefits.)

OTHER MECHANICS AND REPAIRERS

AIR-CONDITIONING, REFRIGERATION, AND HEATING MECHANICS

(D.O.T. 637.281 and .381, 862.281 and .381, and 869.281)

Nature of the Work

Air-conditioning, refrigeration and heating mechanics work on the equipment which cools and heats homes, offices, schools, and other buildings. Major occupations in these fields are air-conditioning and refrigeration mechanic, furnace installer, oil burner mechanic, and gas burner mechanic. Many workers are skilled in more than one of these trades.

Air-conditioning and refrigeration mechanics (D.O.T. 637.281 and .381) install and repair equipment ranging in size from small window units to large central air-conditioning or refrigeration systems. When installing new equipment, they put the motors, compressors, evaporators, and other components in place, following blueprints and design specifications. They connect duct work, refrigerant lines, and other piping and then connect the equipment to an electrical power source. After completing the installation, they charge the system with refrigerant and check it for proper operation.

When air-conditioning and refrigeration equipment breaks down, mechanics diagnose the cause and make repairs. When looking for defects they inspect components such as relays and thermostats.

Furnace installers (D.O.T. 862.381 and 869.281), also called heating equipment installers, follow blueprints or other specifications to install oil, gas, and electric heating units. After setting the heating unit in place, they install fuel supply lines, air ducts, pumps, and other components. They then connect electrical wiring and controls, and check the unit for proper operation.

Oil burner mechanics (D.O.T. 862.281) keep oil-fueled heating systems in good operating condition. During the fall and winter, they service and adjust oil burners. Mechanics determine the reason a burner is not operating properly by checking the thermostat, burner nozzles, controls, and other parts. Mechanics carry replacement parts in their trucks to make repairs in the customer's home or place of business. However, if major repairs are necessary, they usually complete the repairs in the shop. During the summer, mechanics service heating units, replace oil and air filters, and vacuum-clean vents, ducts, and other parts of the heating system that accumulate soot and ash.

Gas burner mechanics (D.O.T. 637.281), also called gas appliance servicers, have duties similar to those of oil burner mechanics. They diagnose malfunctions in gas-fueled heating systems and make necessary repairs and adjustments. They also repair cooking stoves, clothes dryers, and hot water heaters. During the summer, mechanics employed by gas utility companies may inspect and repair gas meters.

Air-conditioning, refrigeration, and heating mechanics use a variety of tools, including hammers, wrenches, metal snips, electric drills, pipe cutters and benders, and acetylene torches. They also use voltmeters, electronic circuit testers and other testing devices.

Cooling and heating systems sometimes are installed or repaired by other craft workers. For example, on a large air- conditioning installation job, especially where workers are covered by union contracts, duct work might be done by sheet-metal workers; electrical work by electricians; and installation of piping, condensers, and other components by pipefitters. Appliance servicers often install and repair window air-conditioners. Additional information about these occupations appears elsewhere in the *Handbook*.

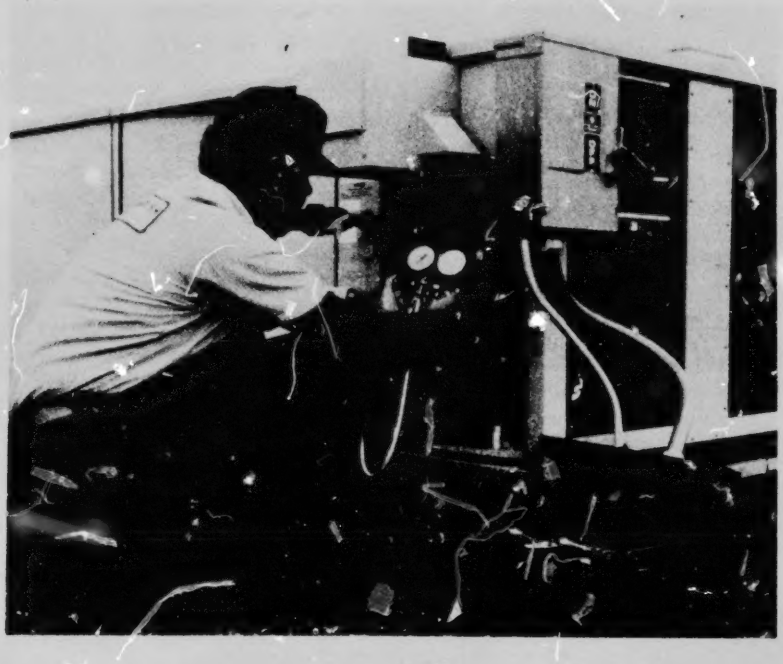
Places of Employment

Approximately 200,000 persons had jobs as air-conditioning, refrigeration, and heating mechanics in 1974. Cooling and heating dealers and contractors employ most air-conditioning and refrigeration mechanics and furnace installers. Fuel oil dealers employ most oil two-burner mechanics, and gas utility companies, most gas burner mechanics.

Air-conditioning and refrigeration mechanics and furnace installers work in all parts of the country. Generally, the geographic distribution of these workers is similar to that of our population. Oil burner mechanics are concentrated in States where oil is a major heating fuel. More than half work in Massachusetts, New Jersey, New York, Pennsylvania, Illinois, and Michigan. Similarly, gas burner mechanics are concentrated in States where gas is a major heating fuel. Almost half worked in Texas, California, Ohio, Michigan, and Illinois.

Training, Other Qualifications, and Advancement

Most air-conditioning, refrigeration, and heating mechanics start as helpers and acquire their skills by working for several years with ex-



Air conditioning mechanic uses voltmeter to locate equipment breakdown.

perienced mechanics. Beginners perform simple tasks, such as insulating refrigerant lines or cleaning furnaces. As helpers gain experience, they are given progressively more complicated tasks, such as installing pumps and burners and checking circuits.

When hiring helpers, employers prefer high school graduates with mechanical aptitude who have had courses in mathematics, physics, electronics, and blueprint reading. Good physical condition also is necessary because helpers sometimes have to lift and move heavy equipment.

Many high schools and vocational schools offer basic mechanic courses in cooperation with local employers and organizations such as the Air-conditioning and Refrigeration Institute and the National Oil Fuel Institute. These courses may last from 2 to 3 years and consist of on-the-job training and classroom instruction.

Employment Outlook

Employment of air- conditioning, refrigeration, and heating mechanics is expected to increase faster than the average for all occupations through the mid-1980's. In addition to the job openings from employment growth, many openings will occur as experienced mechanics transfer to other fields of work, retire, or die.

Most openings will be for air-conditioning and refrigeration mechanics. An increase in household formation and rising personal incomes should result in a very rapid increase in the number of air-conditioned homes. Air-conditioning in schools, factories, and other buildings also is expected to increase. In addition, more refrigeration equipment will be needed in the production, storage, and marketing of food and other perishables.

Employment of furnace installers and gas burner mechanics is expected to follow the growth trends in the construction of homes and businesses. Employment of oil burner mechanics should also grow as customers have their heating systems serviced more frequently in order to conserve oil.

Earnings and Working Conditions

Hourly rates for skilled air-conditioning, refrigeration, and heating mechanics ranged from about $4.50 to $9 in 1974, according to the limited information available. Skilled mechanics generally earned from two to three times as much as inexperienced helpers. Mechanics who worked on both air-conditioning and heating equipment frequently had higher rates of pay than those who worked on only one type of equipment.

Most mechanics work a 40-hour week. However, during seasonal peaks they often work overtime or irregular hours. Air-conditioning and refrigeration mechanics are busiest during spring and summer, and heating mechanics are busiest during fall and winter. Most employers try to provide a full workweek the year round, but they may temporarily reduce hours or lay off some mechanics when seasonal peaks end. However, employment in most shops that service both air-conditioning and heating equipment is fairly stable throughout the year.

Mechanics sometimes are required to work at great heights when installing new equipment. They also may work in awkward or cramped positions. Hazards in this trade include electrical shock, torch burns, and muscle strains and other injuries from handling heavy equipment.

Sources of Additional Information

For more information about em-

ployment and training opportunities, contact the local office of the State employment service or firms that employ air-conditioning, refrigeration, and heating mechanics.

For pamphlets on career opportunities and training, write to:

Air-Conditioning and Refrigeration Institute, 1815 N. Fort Myer Dr., Arlington, Va. 22209.

The Institute prefers not to receive individual requests for large quantities of pamphlets.

For information about training in oil heating systems, write to:

Petroleum Marketing Education Foundation, P. O. Box 11187, Columbia, S.C. 29211.

For career information about gas burner mechanics, write to:

American Gas Association, Inc., 1515 Wilson Blvd., Arlington, Va. 22209.

APPLIANCE REPAIRERS

(D.O.T. 637.281, 723.381, 723.844, and 827.281)

Nature of the Work

Appliance repairers fix all kinds of household appliances such as toasters, irons, refrigerators, and ranges. They often specialize in servicing either electric or gas appliances, and they may specialize in particular items such as clothes washers and dryers or refrigerators and freezers. They also may install appliances, but installations often are done by other workers.

To determine why an appliance is not operating properly, appliance repairers may operate it to detect unusual noises, overheating, or excess vibration. Repairers also look for common sources of trouble such as faulty electrical connections. To check electric and gas systems, they use special tools and testing devices, including ammeters, voltmeters, and pressure gauges. A knowledge of electronics is necessary for many repair jobs.

After locating the trouble, the repairer makes the necessary repairs or replacements. To remove old parts and install new ones, repairers use common handtools, including screwdrivers and pliers, and special tools designed for particular appliances.

Most refrigerators and other large appliances are repaired in customers' homes. If major repairs are necessary, however, the appliance may have to be taken to a repair shop. Repairers answer customers' questions and complaints about appliances and frequently advise customers about the care and use of the appliance. For example, they may show the owners the proper loading of automatic washing machines or how to arrange dishes in dishwashers.

Appliance repairers may give customers estimates on the cost of repairs. They may also keep records of parts used and hours worked on each job.

Places of Employment

About 135,000 people worked as appliance repairers and installers in 1974. A large proportion of these were repairers. Most repairers work in independent appliance stores and repair shops. Others worked for service centers operated by appliance manufacturers, wholesalers, and gas and electric utility companies.

Appliance repairers are employed in almost every community, but are concentrated in the more

Appliance repairers fix washing machine gear assembly.

highly populated States and metropolitan areas.

Training, Other Qualifications, and Advancement

Most appliance repairers start as helpers and acquire their skills through on-the-job training. In some companies they spend a few months helping to install appliances in homes. In other companies, they begin learning basic skills by working in the shop rebuilding used parts such as washing machine transmissions. Trainees gradually learn how motors, gears, and other parts work. They progress from simple repair jobs, such as replacing a switch, to more difficult jobs such as adjusting washer controls. Both trainees and experienced repairers receive supplemental classrooom instruction which is given periodically by appliance manufacturers and local distributors. Up to 3 years of on-the-job training may be needed to become fully qualified in repairing some of the more complex appliances.

Experienced repairers continue to attend training classes periodically, and study service manuals to become familiar with new appliances and the proper ways to repair them.

Persons who want to become appliance repairers should take high school or vocational school courses in electricity, electronics, chemistry, shop math, and blueprint reading. Some employers cooperate with local schools by allowing students to work part time in appliance repair shops while attending school. Formal training in appliance repair and related subjects is available from some vocational schools, technical schools, and community colleges.

Appliance repairers who work in large shops or service centers may be promoted to supervisor, assistant service manager, or service manager. Preference is given to those who show ability to get along with co-workers and customers. Experienced repairers who have sufficient funds may open their own appliance stores or repair shops. Some repairers become instructors who teach other repairers to service new models of appliances. Some become technical writers, who prepare service manuals. A few may advance to managerial positions such as regional service managers or parts managers for appliance manufacturers.

Employment Outlook

Employment of appliance repairers is expected to grow about as fast as the average for all occupations through the mid-1980's. In addition to the jobs created by growth of this occupation, thousands of openings will arise each year to replace experienced repairers who retire, die or transfer to other occupations.

The demand for appliances is expected to increase very rapidly as a result of increases in population and income. Demand also will be stimulated by the introduction of new appliances and by improvements that make existing appliances more attractive or more convenient.

People who enter the occupation should have steady work because the appliance repair business is not very sensitive to changes in economic conditions.

Earnings and Working Conditions

Hourly earnings of appliance repairers ranged from $3.50 to $9 in 1974, based on the limited data available. Starting rates for inexperienced trainees ranged from $2 to $3.25 an hour. The wide variations in wages reflect differences in skill level, type of employer, geographical location, and type of equipment serviced.

Appliance repair shops are generally quiet, well lighted, and adequately ventilated. Working conditions outside the shop vary considerably. For example, repairers sometimes work in narrow spaces and uncomfortable positions amidst dirt and dust. Those who repair appliances in homes may spend several hours a day driving.

Appliance repair work generally is safe, although accidents are possible while handling electrical parts or lifting and moving large appliances. Inexperienced workers are shown how to use tools safely and how to avoid electric shock.

Appliance repairers usually work with little or no direct supervision. This feature of the job appeals to many people.

Sources of Additional Information

For further information about jobs in the appliance service field, contact local appliance repair shops, appliance dealers and utility companies, or the local office of the State employment service.

Information about training programs or work opportunities also is available from:

Association of Home Appliance Manufacturers, 20 N. Wacker Dr., Chicago, Ill. 60606.

AUTOMOBILE BODY REPAIRERS

(D.O.T. 807.381)

Nature of the Work

Automobile body repairers fix damaged motor vehicles by straightening bent frames, removing dents, welding torn metal, and replacing parts that are beyond repair. Usually, they can repair all types of vehicles, but most repairers work mainly on automobiles and small trucks. Some specialize in large trucks, buses, or truck trailers.

Before making repairs, body repairers generally receive instructions from their supervisors, who

determine which parts are to be restored or replaced and estimate how much time the job should take.

Automobile body repairers use special machines to align damaged frames and body sections. They chain or clamp the machine to the damaged metal and apply hydraulic pressure to straighten it. They also may use special devices to align vehicles that have unit-bodies instead of frames. Some repairers specialize in straightening frames and unit-bodies. Body repairers remove badly damaged sections of body panels with a pneumatic metalcutting gun or acetylene torch, and weld in new sections. They push large dents out with a hydraulic jack or hand prying bar, or knock them out with a hand tool or pneumatic hammer. They smooth small dents and creases by holding a small anvil against one side of the damaged area while hammering the opposite side. Very small pits and dimples are removed with pick hammers and punches.

Body repairers use plastic or solder to fill small dents that cannot be worked out of the metal. The hardened filler is filed or ground to a smooth finish.

After being restored to its original shape, the surface is sanded for painting. In most shops, automobile painters do the painting. (These workers are discussed elsewhere in the *Handbook*.) Some smaller shops employ workers who are combination body repairers and painters.

Body repair work has variety—each damaged vehicle presents a different problem. Therefore, in addition to having a broad knowledge of automobile construction and repair techniques, repairers must develop appropriate methods for each job. Most of these skilled people find their work challenging and take pride in being able to restore automobiles.

Body repairers usually work by themselves with only general directions from supervisors. In some shops, they may be assisted by helpers.

Places of Employment

About 145,000 persons worked as automobile body repairers in 1974. Most worked for shops that specialized in body repairs and painting, and for automobile and truck dealers. Other employers included organizations that maintain their own motor vehicles, such as trucking companies and buslines. Motor vehicle manufacturers employed a small number of these workers.

Automobile body repairers work in every section of the country; jobs are distributed in about the same way as population.

Training, Other Qualifications, and Advancement

Most automobile body repairers learn the trade on the job. Young persons usually start as helpers and pick up skills from experienced workers. Helpers begin by assisting body repairers in tasks such as removing damaged parts and installing repaired parts. They gradually learn to remove small dents and make other minor repairs, and progress to more difficult tasks. Generally, 3 to 4 years of on-the-job training are needed to become a fully qualified body repairer. Most training authorities recommend a 3- or 4-year formal apprenticeship program as the best way to learn the trade, but relatively few of these programs are available. Apprenticeship includes both on-the-job and classroom instruction.

Young persons who want to learn this trade should be in good physical condition and have good eye-hand coordination. Courses in automobile body repair offered by high schools, vocational schools, and private trade schools provide helpful experience, as do courses in automobile mechanics. Although completion of high school generally is not a requirement, many employers believe graduation indicates that a young person can "finish a job."

Automobile body repairers must buy handtools, but employers usually furnish power tools. Trainees are expected to accumulate tools as they gain experience. Many workers have a few hundred dollars invested in tools.

An experienced automobile body repairer with supervisory ability may advance to shop supervisor. Many open their own shops. About 1 of every 8 automobile body repairers is self-employed.

Employment Outlook

Employment of automobile body repairers is expected to increase about as fast as the average for all occupations through the mid-1980's.

Employment is expected to increase as a result of the rising number of motor vehicles damaged in traffic. Accidents are expected to increase as the number of motor vehicles grows, even though better highways, driver training courses, lower speed limits, and improved bumpers and safety features on new vehicles may slow the rate of increase.

In addition to the job openings from employment growth, more than a thousand openings are expected each year from the need to replace experienced repairers who retire or die. Also job openings will occur as some workers transfer to other occupations.

Most young persons who enter the occupation may expect steady work since the automobile repair business is not much affected by changes in economic conditions.

Earnings and Working Conditions

Body repairers employed by automobile dealers in 34 large cities

Auto body repairer sands finish.

had estimated average hourly earnings of $7.50 in 1974, about one and three-fourths times the average for all nonsupervisory workers in private industry, except farming. Skilled body repairers usually earn between two and three times as much as inexperienced helpers and trainees.

Many body repairers employed by automobile dealers and repair shops are paid a commission, usually about half of the labor cost charged to the customer. Under this method, earnings depend on the amount of work assigned to the repairer and how fast it is completed. Employers frequently guarantee their commissioned workers a minimum weekly salary. Helpers and trainees usually receive an hourly rate until they are skilled enough to work on commission. Body repairers employed by trucking companies, buslines, and other organizations that maintain their own vehicles usually are paid by the hour. Most body repairers work 40 to 48 hours a week.

Automobile body shops are noisy because of the banging of hammers against metal and the whir of power tools. Most shops are well-ventilated, but often they are dusty and have the odor of paint. Body repairers often work in awkward or cramped positions, and most of their work is strenuous and dirty. Hazards include cuts from sharp metal edges, burns from torches and heated metal, and injuries from power tools.

Many automobile body repairers are members of unions, including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Most body repairers who are union members work for large automobile dealers, trucking companies, and buslines.

Sources of Additional Information

More details about work opportunities may be obtained from local employers, such as automobile body repair shops and automobile dealers; locals of the unions previously mentioned; or the local office of the State employment service. The State employment service also may be a source of information about apprenticeship and other programs that provide training opportunities.

For general information about the work of automobile body repair workers, write to:

Automotive Service Industry Association, 230 North Michigan Ave., Chicago, Ill. 60601.

Automotive Service Councils of America, Inc., 4001 Warren Blvd., Hillside, Ill. 60162.

AUTOMOBILE MECHANICS

(D.O.T. 620.131 through .381, .782, and .885; 721.281 and 825.281)

Nature of the Work

Automobile mechanics perform preventive maintenance, diagnose breakdowns, and make repairs on automobiles. (Although truck mechanics, bus mechanics, and automobile body repairers are sometimes called "automobile mechanics," they are discussed separately in the *Handbook*.)

Preventive maintenance is the periodic examination, and adjustment, repair, or replacement of parts before they go bad. This responsibility of the mechanic is vital to safe and troublefree driving. In preventive maintenance, mechanics may follow a checklist to be sure they examine all important parts. The list may include distributor points, spark plugs, carburetor, wheel balancing, and other potentially troublesome parts.

When mechanical or electrical troubles occur, mechanics first get a description of the symptoms from the owner. If the cause of the trouble is hard to find, the mechanic may use testing equipment, such as motor analyzers, spark plug testers, or compression gauges. The ability to make a quick and accurate diagnosis is one of the mechanic's most valuable skills. It requires analytical ability as well as a thorough knowledge of automobiles. Many mechanics consider diagnosing "hard to find" troubles one of their most challenging and satisfying duties.

After locating the problem, mechanics make adjustments and repairs, such as grinding valves or cleaning the carburetor. Badly worn parts are replaced.

Automobile mechanics use many kinds of tools ranging from simple handtools (screwdrivers, wrenches,

pliers), to complicated equipment, such as wheel alignment machines and headlight aimers; they also use testing equipment. Mechanics also consult repair manuals and parts catalogs, since various makes of automobiles require different parts and adjustments.

Most automobile mechanics perform a variety of repairs; others specialize. For example, *automatic transmission specialists* work on gear trains, couplings, hydraulic pumps, and other parts of automatic transmissions. These are complex mechanisms; their repair requires considerable experience and training, including a knowledge of hydraulics. *Tune-up mechanics* adjust the ignition timing and valves, and adjust or replace spark plugs, distributor points, and other parts to insure efficient engine performance. They often use scientific test equipment to locate malfunctions in fuel and ignition systems. *Automobile air-conditioning specialists* install air-conditioners and service components such as compressors and condensers. *Front-end mechanics* align and balance wheels and repair steering mechanisms and suspension systems. They frequently use special alignment equipment and wheel-balancing machines. *Brake mechanics* adjust brakes, replace brake linings, repair hydraulic cylinders, and make other repairs on brake systems. Those employed in repair shops that specialize in brake service also may replace shock absorbers, springs, and mufflers. In some shops, combination front-end and brake mechanics are employed. *Automobile-radiator mechanics* clean radiators with caustic solutions, locate and solder leaks, and install new radiator cores. They also may repair heaters and air-conditioners, and solder leaks in gasoline tanks. *Automobile-glass mechanics* replace broken windshield and window glass and repair window operating mechanisms. They install preformed glass to replace curved windows, and they use window patterns and glass cutting tools to cut replacement glass from flat sheets. In some cases they may repair minor damage, such as pits, rather than replace the window.

Places of Employment

Over 700,000 persons worked as automobile mechanics in 1974. Most worked for automobile dealers, automobile repair shops, and gasoline service stations. Others were employed by Federal, State, and local governments, taxicab and automobile leasing companies, and other organizations that repair their own automobiles. Some mechanics also were employed by automobile manufacturers to make final adjustments and repairs at the end of the assembly line. A small number of mechanics worked for department stores that have automobile service facilities.

Most automobile mechanics work in shops that employ from one to five mechanics, but some of the largest shops employ more than 100. Generally, automobile dealer shops are larger than independent shops.

Automobile mechanics work in every section of the country. Geographically, employment is distributed about the same as population.

Training, Other Qualifications, and Advancement

Most automobile mechanics learn the trade on the job. Young persons usually start as helpers, lubrication workers, or gasoline station attendants, and gradually acquire skills by working with experienced mechanics. Although a beginner can make simple repairs after a few months' experience, 3 to 4 years are required to become an all-round mechanic. An additional year or two is necessary to learn a difficult specialty, such as automatic transmission repair. In contrast, radiator mechanics, glass mechanics, and brake specialists, who do not need an all-round knowledge of automobile repair, may learn their jobs in about 2 years.

Most training authorities recommend a 3- or 4-year formal apprenticeship program. These programs include both on-the-job training and classroom instruction in nearly all phases of automobile repair.

For entry jobs, employers look for young persons with mechanical aptitude and a knowledge of automobiles. Generally, a driver's license is required. Practical experience in automobile repair gained from the Armed Forces or working on cars as a hobby is valuable. Completion of high school is an advantage in obtaining an entry job, because to most employers it indicates that a young person can finish a job and has potential for advancement. Courses in automobile repair offered by many high schools, vocational schools, and private trade schools are helpful. Courses in science and mathematics help a person better understand how an automobile operates.

Most mechanics must buy their handtools. Beginners are expected to accumulate tools as they gain experience. Many experienced mechanics have several hundred dollars invested in tools. Employers furnish power tools, engine analyzers, and other test equipment.

Employers sometimes send experienced mechanics to factory training centers to learn to repair new-car models or to receive special training in subjects such as automatic transmission or air-conditioning repair. Manufacturers also send representatives to local shops to conduct short training sessions. A relatively small number of young high school graduates are selected by automobile dealers to attend fac-

tory-sponsored mechanic training programs.

Experienced mechanics who have leadership ability may advance to shop supervisor or service manager. Mechanics who like to work with customers may become service advisors. Many mechanics open their own repair shops or gasoline service stations. About one out of seven automobile mechanics is self-employed.

Employment Outlook

Job opportunities for automobile mechanics will be plentiful in the years ahead. Because this is one of the largest blue-collar occupations, replacement needs are high. Thus, in addition to openings that will be created by employment growth, thousands of job openings will arise each year due to the need to replace experienced mechanics who retire, die, or change jobs.

Employment of automobile mechanics is expected to increase at about the same rate as the average for all occupations through the mid-1980's. The number of mechanics is expected to increase because expansion of the driving age population and consumer purchasing power will increase the number of automobiles. Employment also is expected to grow because a greater number of automobiles will be equipped with pollution control devices, airconditioning, and other features that increase maintenance requirements.

Most young persons who enter the occupation may expect steady work, as the automobile repair business is not very vulnerable to changes in economic conditions.

Earnings and Working Conditions

Skilled automobile mechanics employed by automobile dealers in 34 cities had estimated average hourly earnings of $7.02 in 1974, about two-thirds more than the average for all nonsupervisory workers in private industry, except farming. Skilled mechanics usually earn between two and three times as much as inexperienced helpers and trainees.

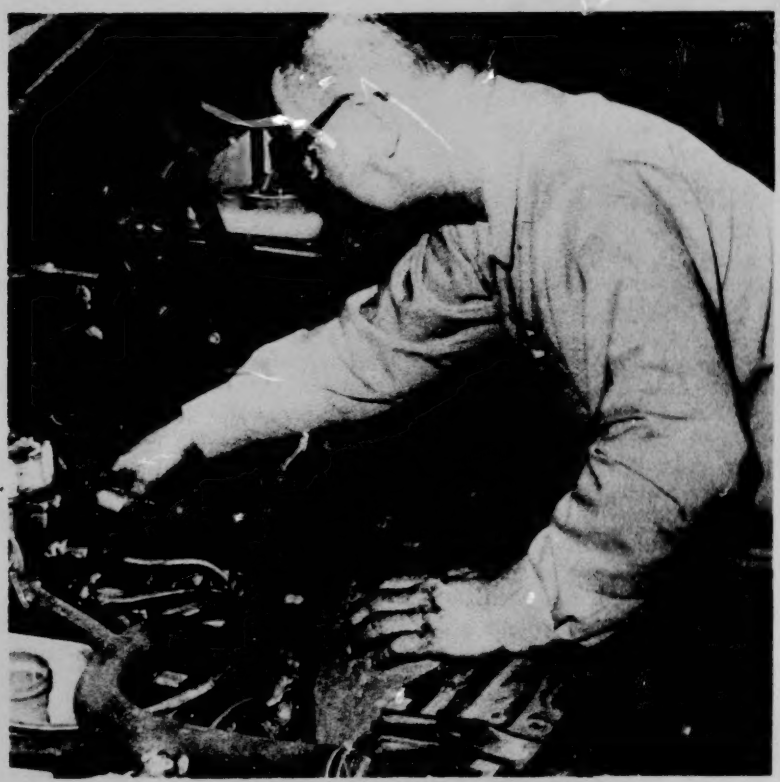
Many experienced mechanics employed by automobile dealers and independent repair shops are paid a commission, usually about half the labor cost charged to the customer. Under this method, weekly earnings depend on the amount of work assigned and completed by the mechanic. Employers frequently guarantee commissioned mechanics a minimum weekly salary. Helpers and trainees usually are paid an hourly rate until they are sufficiently skilled to work on commission. Some mechanics receive an hourly rate.

Most mechanics work between 40 and 48 hours a week, but many work even longer hours during busy periods. Mechanics paid by the hour frequently receive overtime rates for hours over 40 a week.

Generally, a mechanic works indoors. Modern automobile repair shops are well ventilated, lighted, and heated, but older shops may not have these advantages.

Mechanics frequently work with dirty and greasy parts, and in awkward positions. Sometimes they must lift heavy objects. Minor cuts and bruises are common, but serious accidents usually are avoided by observing safety practices.

Some mechanics are members of labor unions. Among the unions organizing these workers are the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and



Helpers of America (Ind.).

Sources of Additional Information

For more details about work opportunities, contact local employers such as automobile dealers and repair shops; locals of the unions previously mentioned; or the local office of the State employment service. The State employment service also may have information about apprenticeship and other programs that provide training opportunities.

For general information about the work of automobile mechanics, write to:

Automotive Service Industry Association, 230 North Michigan Ave., Chicago, Ill. 60601.

Automotive Service Councils of America, Inc., 4001 Warren Blvd., Hillside, Ill. 60162.

National Automobile Dealers Association, 2000 K St. NW., Washington, D.C. 20006.

BOAT-MOTOR MECHANICS

(D.O.T. 623.281 and 625.281

Nature of the Work

Boat motors have many things in commmon with automobile motors, including unannounced breakdowns. A reliable motor is particularly essential in boating. Breakdowns far from shore can leave a boater stranded for hours—a frustrating and potentially dangerous predicament if the weather turns bad.

To minimize the possibility of breakdowns, motor manufacturers recommend periodic inspections of engines by qualified mechanics to have motors examined and repaired and worn or defective parts replaced. Also, at periodic intervals the mechanic may replace ignition points, adjust valves, and clean the carburetor. After completing these tasks, the motor will be run to check for other needed adjustments. Routine maintenance jobs normally make up most of the mechanic's workload.

When breakdowns occur, mechanics diagnose the cause and make the necessary repairs. A quick and accurate diagnosis— one of the mechanic's most valuable skills—requires problem-solving ability as well as thorough knowledge of the motor's operation. Some jobs require only the replacement of a single item, such as a fuel pump, and may be completed in less than an hour. In contrast, tearing down and reassembling a motor to replace worn valves, bearings, or piston rings may take a day or more.

Mechanics may specialize in either outboard or inboard motors, although many repair both. Most small boats have portable gasoline fueled outboard motors. Larger craft such as cabin cruisers and commercial fishing boats are powered by inboard motors that are located inside the boat and are similar to automobile engines. Some inboards burn diesel fuel rather than gasoline.

In large shops, mechanics usually work only on motors and other running gear. In small shops they also may patch and paint hulls, and repair steering mechanisms, lights, and other boat equipment, such as refrigerators, two-way radios, and depth finders. In addition, they may repair motorcycles, mini-bikes, snowmobiles, lawnmowers, and other machines which have small gasoline engines that are similar to outboard motors.

Mechanics use common handtools such as screwdrivers and wrenches; power and machine tools including drills and grinders; and hoists to lift motors and boats. Motor analyzers, compression gauges, and other testing devices help mechanics locate faulty parts. Mechanics refer to service manuals for assistance in assembling and repairing motors.

Places of Employment

Most of the 11,000 full-time boat-motor mechanics employed in 1974 worked in the shops of boat dealers and marinas. The next largest area of employment was in boat manufacturing plants where mechanics are employed to make final adjustments and repairs at the end of assembly lines. A small number of mechanics worked for boat rental firms. Marinas operated by Federal, State, and local governments also employed mechanics.

Dealer and marina shops typically employ one to three mechanics, few employ more than 10. Some small dealers and marinas do not employ mechanics; owners do the repair work or send it to larger shops.

Boat-motor mechanics work in every State, but employment is concentrated along coastal areas in New York, Florida, Texas, California, Louisiana, Washington, and New Jersey, and near the numerous lakes and rivers in Michigan, Minnesota, Wisconsin, Illinois, Ohio, Indiana, and Missouri. Mechanics who specialize in outboard motors work in all areas. Those who specialize in inboard motors generally work near oceans, bays, and large lakes.

Training, Other Qualifications, and Advancement

Boat-motor mechanics learn the trade on the job. At first, trainees clean boats and motors and do other odd jobs. Then, under the guidance of experienced mechanics, trainees learn to do other routine mechanical tasks such as replacing ignition points and spark plugs. As trainees gain experience, they progress to more difficult tasks such as diagnosing the cause of breakdowns and overhauling motors. Generally, an inex-

Boat motor mechanic checks service manual for assistance.

perienced beginner needs 2 to 3 years on the job to become skilled in repairing both outboard and inboard gasoline motors. A capable mechanic can learn to repair diesels in an additional year or two.

Employers sometimes send trainees and mechanics to factorysponsored courses for 1 to 2 weeks. Trainees learn the fundamentals of motor repair. Mechanics upgrade their skills and learn to repair new models.

In the past few years, several schools around the country have begun to offer formal training courses in marine engine repair and maintenance.

When hiring trainees, employers look for young persons who have mechanical aptitude, are in good physical condition, and have an interest in boating. High school graduates are preferred, but many employers will hire applicants with less education. High school courses in small engine repair, automobile mechanics, and machine shop are helpful, as are science and mathematics. Before graduating, a person may be able to get a summer job as a mechanic trainee.

Mechanics usually are required to furnish their own handtools which cost several hundred dollars. Employers provide power tools and test equipment.

Mechanics with leadership ability can advance to supervisory positions such as shop supervisor or service manager. Mechanics who have the necessary capital may open their own dealerships or marinas.

Employment Outlook

Employment of boat-motor mechanics is expected to grow faster than the average for all occupations through the mid-1980's. In addition to the need to fill new positions, a few hundred openings will arise each year as experienced mechanics retire, die, or transfer to other occupations.

Employment is expected to increase due to the growth in the number of boats. As population grows and people have more time for recreation, boating like other leisure activities, will probably expand. Growth in the number of mini-bikes and snowmobiles also will add to the demand for mechanics.

Employment opportunities will be particularly favorable for mechanics who have a knowledge of electricity and electronics. Electrical appliances are becoming more common on boats and many new boats have two–way radios and depth finders.

Earnings and Working Conditions

In 1974, hourly earnings of experienced mechanics ranged from about $3 to $8.50, based on information obtained from a limited number of boat dealers and marinas. Experienced mechanics generally earned two to three times as much as trainees.

Most mechanics are paid an hourly rate or weekly salary. Others are paid a percentage—usually 50 percent—of the labor charge for each repair job. If mechanics are paid on a percentage basis, their weekly earnings depend on the amount of work they are assigned and on the length of time they take to complete it.

Boating activity increases sharply as the weather grows warmer. Consequently, many mechanics work more than 40 hours a week in spring and summer. During winter, however, they may work less than 40 hours a week; a relatively small number are laid off. In Northern States, some of the winter slack is

taken up by repair work on snowmobiles.

The work is not hazardous, but mechanics sometimes suffer cuts, bruises, and other minor injuries. Shop working conditions vary from clean and spacious to dingy and cramped. All shops are noisy when engines are being tested. Mechanics occasionally must work in awkward positions to adjust or replace parts. For many mechanics, however, these disadvantages are more than compensated for by the variety of assignments and the satisfaction which comes from solving problems. Moreover, mechanics may enjoy working near water recreation areas.

Sources of Additional Information

For details about training or work opportunities, contact local boat dealers and marinas or local State employment offices.

BOWLING-PIN-MACHINE MECHANICS

(D.O.T. 639.381 and 829.281)

Nature of the Work

Bowling-pin-machine (or automatic pinsetting machine) mechanics repair and maintain the tens of thousands of pinsetting machines in use today. These complex machines automatically return the ball to the bowler, clear fallen pins, and reset pins.

Mechanics must have a thorough knowledge of the mechanism of pinsetting machines to keep them running properly. This knowledge is especially important when machines malfunction, because mechanics must quickly find the cause of the trouble and make repairs or adjustments so that bowlers will not be inconvenienced and annoyed.

Much of the time mechanics work to prevent breakdowns and delays. They regularly inspect pinsetting machines and clean, lubricate, and adjust them. When delays do occur, mechanics repair or replace parts, such as broken chains, worn shock absorbers, and faulty electrical parts. Mechanics refer to troubleshooting manuals and diagrams of electrical circuits to guide their work.

Mechanics use many different types of tools, such as wrenches, screwdrivers, hammers, portable hoists, and lubricating guns. They use ohmmeters, voltmeters, and other devices to test electrical circuits, relays, transformers, and motors. Often mechanics will buy their own handtools but employers usually supply special tools.

One or more assistant mechanics or trainees are trained by mechanics to locate and correct minor problems in pinsetting machines by demonstrating how the machines operate and by disassembling components and explaining their functions. Trainees also learn how to break minor pin-jams and recondition pins.

Mechanics do some clerical work. They order replacement parts and keep inventory of parts in stock. They also may keep records of machine malfunctions and estimate maintenance costs.

Places of Employment

About 5,000 bowling-pin-machine mechanics were employed in 1974. Almost all worked in bowling centers. A small number were employed by manufacturers of pinsetting machines to install and service the machines.

Bowling-pin-machine mechanics are employed in every State, but employment is concentrated in heavily populated areas, where there are many bowling centers.

Training, Other Qualifications, and Advancement

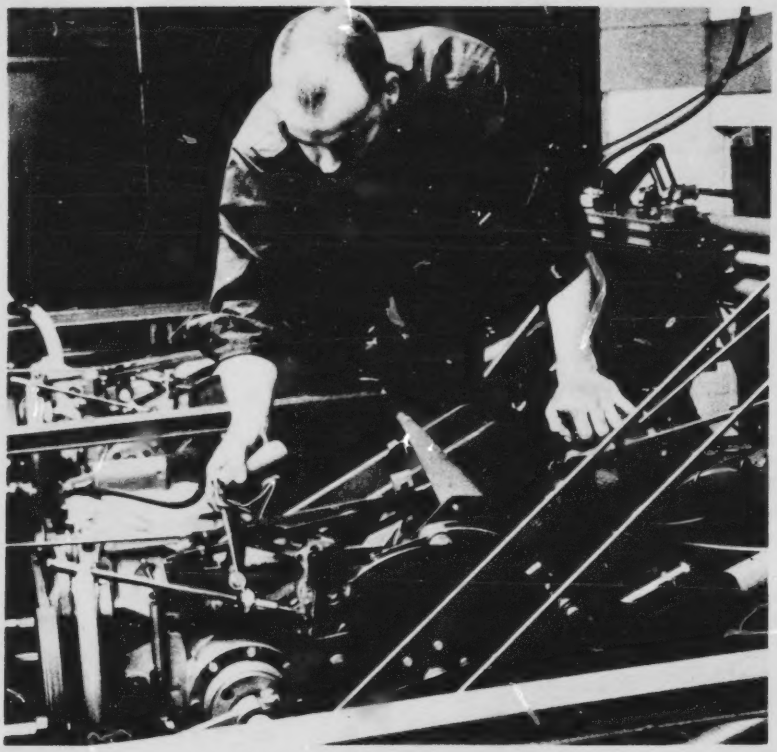
Pinsetting machine mechanics usually start out as trainees. Employers prefer to hire applicants who are high school graduates, although many have not completed high school. Courses in electricity, blueprint reading, shop math, and machine repair are useful.

A few mechanic trainees are sent to schools operated by bowling machine manufacturers. To attend a factory school, candidates must take written tests to determine their mechanical aptitude. Usually, they must be at least 16 years old. Trainees' wages and expenses are paid by employers during the training period, which usually lasts 4 weeks. Trainees study the structure and operation of machines made by the firm operating the school, and learn to locate typical sources of trouble. They learn to perform preventive maintenance, to read wiring diagrams, and to use the tools of the trade. After attending factory schools, trainees usually need several months of on-the-job experience to qualify as mechanics.

Trainees who do not attend factory schools receive instruction in machine operation and maintenance by watching experienced mechanics at work. Usually, 1 to 2 years of on-the-job training and experience are needed to acquire mechanics' skills.

People planning careers as bowling-pin-machine mechanics should have good eyesight (including normal color vision), eye-hand coordination, and average physical strength. They also should have mechanical ability and like to work with their hands. Because speed is usually required in repairing pinsetting machines, ability to work under pressure also is important.

A qualified mechanic trainee employed in a bowling center may be promoted to assistant mechanic and then to head mechanic. Some mechanics become managers or owners of bowling establishments. Those who work for manufacturers may advance to service manager or instructor in a training school.



Mechanic lubricates bowling pin machine.

Employment Outlook

Employment of bowling-pin-machine mechanics is expected to grow slower than the average for all occupations through the mid-1980's. Most job openings will arise because of the need to replace experienced mechanics who retire, die, or transfer to other fields of work. However, because this occupation is very small, only a limited number of openings will become available.

The demand for bowling facilities is likely to grow as population and incomes rise. Employment of mechanics, however, will be limited by improvements in pinsetting machines. Older machines are being replaced by improved models that need less maintenance; thus, mechanics are able to service a greater number of machines.

Earnings and Working Conditions

Hourly earnings in 1974 ranged from $3 for mechanic trainees up to $5.50 for head mechanics, according to the limited information available.

Mechanics work in a long, relatively narrow corridor at the end of bowling lanes where the automatic machines are located. The work area has space for a workbench and is usually well lighted and well ventilated, but quite noisy when the lanes are operating. When making repairs and adjustments, mechanics frequently have to climb and balance their bodies on the framework of the pinsetting machines, and to stoop, kneel, crouch, and crawl around the machines. Those who install and service machines for manufacturers must travel.

Mechanics usually do not have to wear any special safety devices, such as goggles. Pin-setting machines have safety guards, but workers are subject to common shop hazards, such as electrical shock, cuts, falls, and bruises. They often wear coveralls for protection from grease and dirt.

Mechanics and trainees employed in large metropolitan areas generally are members of unions, usually the Service Employees International Union or the International Brotherhood of Teamsters, Chauffeurs, Warehousemen, and Helpers of America (Ind.)

Sources of Additional Information

People who want further information about training or work opportunities in this trade should contact bowling centers in their area, the local bowling proprietors' association, or locals of the unions previously mentioned. The local office of the State employment service is another source of information about employment and training opportunities.

BUSINESS MACHINE REPAIRERS

(D.O.T. 633.281)

Nature of the Work

Business machine repairers maintain and repair the machines that are used to speed the paperwork in business and government. These include typewriters, adding and calculating machines, cash registers, dictating machines, postage meters, and duplicating and copying equipment. (Technicians who work on computers are discussed in a separate statement elsewhere in the *Handbook*.)

Business machine repairers often work in offices where the machines are used. They may maintain equip-

ment by regular, frequent visits to inspect, clean, and oil the machines, or to make minor repairs or adjustments. When machines break down, they diagnose and correct the cause of the trouble. Often repairers locate the problem and make repairs on the spot. For major repairs, however, they usually take machines to the shop. Some repairers service a variety of machines; but most specialize in one or a few types. For example, specialists usually service duplicators, copiers, postage meters, and mailing equipment.

Repairers use common handtools, such as screwdrivers and pliers, and test equipment, such as guages and meters. In large shops, they use drill presses, lathes, and other power equipment.

Business machine servicing offers considerable variety in work assignments. People who have analytical ability find considerable satisfaction in locating and correcting the cause of trouble in a malfunctioning machine.

Some repairers may also do sales work. Most commonly, they sell preventive maintenance contracts for regular machine servicing. Some also sell supplies, such as special paper, ink, ribbons, and stencils.

Places of Employment

About 65,000 people worked as business machine repairers in 1974. About three-fourths of business machine repairers worked mainly on typewriters, calculators and adding machines, and copiers and duplicators. Most of the rest serviced accounting-bookkeeping machines, cash registers, and postage and mailing equipment. A small number repaired dictating machines.

Most repairers worked for business machine manufacturers, dealers, and repair shops. The remainder worked for Federal, State and local governments, and large organizations that had enough machines to justify full-time repairers.

In a manufacturer's branch office, repairers usually work exclusively on the manufacturer's products. They specialize in one or two machines or service the full line of equipment. In a small city, specialization is impractical so most repairers service and sell all kinds of equipment.

Business machine repairers work throughout the country. Even relatively small communities usually have at least one or two repair shops. Most repairers, however, work in large cities.

Training, Other Qualifications, and Advancement

Applicants for entry jobs as business machine repairers usually need at least a high school education. Some companies accept young people who have not completed high school. Employers like to employ veterans who have had electronics training in the Armed Forces. Applicants who are interested in working on electronic equipment must have 1 year or more of training or experience in electronics.

Applicants for entry jobs may have to pass tests that measure mechanical aptitude, knowledge of electricity or electronics, manual dexterity, and general intelligence. Good eyesight, including color vision, is needed.

Employers seek applicants who have a pleasant, cooperative manner. Because most machine servicing is done in customers' offices, the ability to work without interrupting the office routine is very important. A neat appearance and ability to converse effectively also are desirable.

Some employers require that business machine repairers be bonded. Applicants for these jobs must be honest and trustworthy since they are exposed to large sums of money and other valuables in banks and offices. Repairers also may collect money from customers for services and supplies.

Beginners generally acquire skills through on-the-job training, work experience, and instruction in manufacturers' schools. Some vocational and private correspondence schools conduct courses in business machine maintenance.

Business machine repairers who work in a manufacturer's branch office learn to repair only the company's line of machines. Trainees usually attend company schools from a few weeks to several months, depending on the type of machine they will service. They then receive from 1 to 3 years of practical experience and on-the-job training before they become fully qualified repairers. Occasionally, they may return to factory schools for special instruction in new business machine developments. Business machine repairers are encouraged to broaden their technical knowledge during nonworking hours. Many companies pay the repairer's tuition for work-related courses in college and technical schools.

Business machine repairers may move into sales positions for greater earnings. Repairers who show exceptional abilities also may advance to service manager or supervisor. Experienced repairers sometimes open their own repair shops; those who work in manufacturers' branch offices sometimes become independent dealers or buy sales franchises from the company.

Employment Outlook

Employment of business machine repairers is expected to grow faster than the average for all occupations through the mid-1980's. In addition to jobs from employment growth, many openings will arise as experienced repairers retire, die, or change occupations.

Employment opportunities for qualified beginners are good. Busi-

Business machine repair is cleaner and lighter than the work in most mechanical trades.

ness and government will buy more machines to handle the growing volume of paperwork and more people will be trained to maintain and repair these machines. In recent years, many technical changes have occurred in business machines. For example, electronic calculating machines have replaced mechanical models. Because of the greater use of such equipment, opportunities will be particularly favorable for repairers who have training in electronics; within several years training in electronics may even become prerequisite for business machine repair jobs.

Business machine repairers work year-round and have steadier employment than many other skilled workers. Office machines must be maintained, even when business slackens, since records must be kept, correspondence carried on, and statistical reports prepared.

Earnings and Working Conditions

Information from a limited number of employers in 1974 indicated that experienced repairers generally earned from $165 to $300 a week. Earnings usually were highest for those who repaired electronic business machines and complex duplicating and copying equipment.

New trainees earn from $120 to $200 a week. As they become more skilled their pay increases. People who have previous electronics training in the Armed Forces or civilian technical schools generally receive somewhat higher beginning wages.

In addition to salaries, repairers in some companies receive commissions for selling supplies or service contracts.

Servicing business machines is cleaner and lighter than the work in most other mechanical trades. Repairers generally wear business clothes and do most of their work in the customer's office. Injuries are uncommon. Some positions involve considerable traveling within the area served by the employer. Repairers who use their own cars for company business are reimbursed on a mileage basis. Employers usually pay for all tools.

Sources of Additional Information

For more details about job opportunities, contact local firms that sell and service business machines and the local office of the State employment service.

COMPUTER SERVICE TECHNICIANS

(D.O.T. 828.281)

Nature of the Work

Computer systems play a vital role in today's way of life. They help us make telephone calls, receive paychecks on time, and reserve tickets for travel, hotels, and entertainment. In business and industry, computer systems perform a wide variety of complicated tasks—from keeping business records to controlling manufacturing processes.

A computer system is the combination of a computer and computer-related machines, such as magnetic tape readers and high speed printers. Keeping this intricate set of machines in good working order is the job of a highly qualified computer service technician.

At regular intervals, technicians (often called field engineers or customer engineers) service machines or systems to keep them operating efficiently. They routinely adjust, oil, and clean mechanical and electromechanical parts. They also check electronic equipment for loose connections and defective components or circuits.

Despite this regular care, however, computer equipment sometimes breaks down. Technicians must then find the cause of the failure and make repairs. For example, they may replace a faulty circuit board, resolder a broken connection, or repair a mechanical part. They must complete the job as quickly as possible, because working time lost during a computer breakdown may cost a customer several hundred or even thousands of dollars an hour.

Computer technicians often help install new equipment. They lay cables, hook up electrical connections between machines, thoroughly test the new equipment, and correct any problems before the customer uses the machine.

Some technicians specialize in maintaining a particular computer model or system, or in doing a certain type of repair. For example, some technicians are experts in correcting problems caused by errors in the computer's internal programming. Specialists usually have advanced training and several years of experience.

To diagnose electronic failures, technicians must use several kinds of test equipment, including voltmeters, ohmmeters, and oscilloscopes. They also run special computer programs that help pinpoint some kinds of malfunctions. Technicians also use a variety of handtools such as needle-nosed pliers, wirestrippers, and soldering equipment. The employer supplies tools and test equipment, but technicians may be responsible for keeping them in good condition and working order.

Besides knowing how to use specialized tools and test equipment, computer technicians must be familiar with technical and repair manuals for each piece of equipment. They also must keep up with the technical information and revised maintenance procedures issued periodically by computer manufacturers.

Technicians keep a record of preventive maintenance and repairs on each machine they service. In addition, they fill out time and expense reports, keep parts inventories, and order parts.

Although technicians spend most of their time working on machines, they work with people also. They listen to customers' complaints, answer questions, and sometime offer technical advice on ways to keep equipment in good condition. Experienced technicians help train new technicians and sometimes have supervisory duties.

Places of Employment

In 1974, about 50,000 persons were employed as computer service technicians. Most worked in service departments of computer manufacturing firms. A small number worked for companies that sell computer maintenance services and for the Federal Government and other organizations that have large computer installations.

Computer technicians work in all parts of the country, usually in urban areas where most computer equipment is located. Some technicians work full time at a single installation, such as a large computer center operated by a bank or insurance company. Others travel from place to place to maintain several different systems or to make emergency repairs. A technician with special training or experience may travel hundreds of miles from the home office to handle difficult repair jobs. Technicians who work for a nationwide organization must sometimes transfer to another city or State.

Training, Other Qualifications, and Advancement

Most employers require applicants for technician trainee jobs to have 1 to 2 years' post-high school training in basic electronics or electrical engineering. This training may be from a public or private technical institute, a college, or a junior college. Basic electronics training offered by the Armed Forces is excellent preparation for technician trainees.

A high school student interested in becoming a computer service technician should take courses in mathematics and physics. High school courses in electronics and computer programming also are helpful. Young people can also gain valuable experience through hobbies which involve electronics, such as operating ham radios or building stereo equipment.

Besides technical training, applicants for trainee jobs must have good close vision and normal color perception to work with small parts and color-coded wiring. Normal hearing is needed since some breakdowns are diagnosed by sound. Because technicians usually handle jobs alone, they must have the initiative to work without close supervision. Also important are a pleasant personality and neat appearance, since the work involves frequent contact with customers. Applicants must pass a physical examination and, in some cases, get a security clearance.

Trainees usually attend company training centers for 3 to 6 months to

Technician uses test equipment to diagnose computer malfunction.

learn elementary computer theory, computer math, and circuitry theory and to further their study of electronics. Classroom work is accompanied by practical training in operating computer equipment, doing basic maintenance, and using test equipment.

In addition to formal instruction, trainees must complete 6 months to 2 years of on-the-job training. At first they work closely with experienced technicians, learning to maintain card readers, printers, and other machines that are relatively simple, but that have the basic mechanical and electronic features of a large computer system. As trainees gain experience they work on more complex equipment.

Because manufacturers continually redesign equipment and develop new uses for computers, experienced technicians frequently must attend training sessions to keep up with these changes and to broaden their technical skills. Many technicians take advanced training to specialize in a particular computer system or type of repair. Instruction also may include programming, systems analysis, and other subjects that improve the technician's general knowledge of the computer field.

Experienced technicians with advanced training may become specialists who help technicians make difficult repairs and work with engineers in designing equipment and developing maintenance procedures. Those with leadership ability may become supervisors or service managers.

Although advancement depends mainly on ability and experience, chances are improved if the technician has a bachelor's degree in electrical engineering. Many technicians get their degrees at company expense. Engineers interested in professional careers in computer service work often start out as technicians.

Most computer equipment operates on the same basic principles, but machines built by different companies may be unique in design and construction. For this reason, technicians may find it difficult to transfer from one company to another; they may need some retraining if they do. Technicians who tranfer may lose seniority and need some retraining.

Training and experience in computer maintenance may also qualify a technician for jobs in programming, systems analysis, management, and equipment sales. (See statements on Programmers, Systems Analysts, and Office Machine and Computer Manufacturing elsewhere in the *Handbook*.)

Employment Outlook

Employment of computer technicians is expected to grow much faster than the average for all occupations through the mid-1980's. As the Nation's economy expands, more computer equipment will be used and more technicians will be needed to install and maintain it. Business, government, and other organizations will buy or lease additional equipment to manage vast amounts of information, control manufacturing processes, and aid in scientific research. The development of new uses for computers in fields such as medicine and traffic control also will spur demand.

Although most job openings will result from rising demand for these workers' services, many also will occur as experienced technicians advance to more responsible jobs or move into other occupations. Because most technicians are young, relatively few openings will

stem from deaths and retirements. Most openings will be in metropolitan areas.

Downturns in the economy will tend to have a less negative effect on job openings for computer service technicians than for most occupations because even when business is declining firms will continue to use computers for accounting and other data processing.

Earnings and Working Conditions

Starting salaries for computer service technician trainees ranged from about $130 to $200 a week in 1974, according to the limited information available. Salaries for experienced technicians ranged from about $180 to $325 a week.

The normal workweek is 40 hours, but technicians often work overtime and on weekends to make emergency repairs. Many technicians work rotating shifts—days one week, nights the next. Employers pay for travel, including reimbursement for job-related uses of the technician's car and work-related education expenses.

Although some bending and lifting is necessary, the computer technician's job is not strenuous. Work hazards are limited mainly to burns and electrical shock, and can be avoided if safety practices are followed.

Sources of Additional Information

General information on careers in computer maintenance is available from:

American Federation of Information Processing Societies, Inc., 210 Summit Ave., Montvale, N.J. 07645.

Institute of Electrical and Electronic Engineers, 345 East 47th St., New York, N.Y. 10017.

The personnel and service departments of computer manufacturers and the local office of the State employment service may have details on training and job oportunities.

The State department of education at each State's capital can furnish information about approved technical institutes, junior colleges, and other institutions offering post-high school training in basic electronics. Information about these schools also is available from:

American Association of Junior Colleges, Suite 410, 1 Dupont Circle, Washington, D.C. 20036.

DIESEL MECHANICS

(D.O.T. 625.281)

Nature of the Work

Diesel mechanics repair and maintain diesel engines that power transportation equipment, such as heavy trucks, buses, boats, and locomotives; and construction equipment, such as bulldozers and cranes. They also service diesel farm tractors and a variety of other diesel-powered equipment, such as compressors and pumps used in oil well drilling and in irrigation.

Before making repairs, diesel mechanics inspect and test engine components to determine why an engine is not operating properly. After locating the trouble, they repair or replace defective parts and make adjustments. Preventive maintenance—avoiding trouble before it starts—is another major responsibility. For example, they may periodically inspect, test, and adjust engine components.

Many mechanics make all types of diesel engine repairs. Others spe-

Diesel mechanics repair and maintain a variety of diesel-powered equipment.

cialize, for example, in rebuilding engines or in repairing fuel injection systems, turbochargers, cylinder heads, or starting systems. Some also repair large natural gas engines used to power generators and other industrial equipment.

Diesel mechanics' job titles often indicate the type of equipment they repair. For example, those who repair diesel engines in trucks may be called diesel truck mechanics. Those who work on construction equipment, such as bulldozers and earthmovers, are usually called heavy diesel-equipment mechanics. In addition to maintaining and repairing engines, the mechanics listed above may work on other parts of diesel-powered equipment, such as brakes and transmissions. (See statement on Truck Mechanics and Bus Mechanics elsewhere in the *Handbook*.)

Diesel mechanics use pliers, wrenches, screwdrivers, and other common handtools as well as special tools, such as valve refacers and piston pin-fitting machines. In addition, they may use complex testing equipment, such as a dynamometer to measure engine power, and special fuel injection testing equipment. Mechanics also may use machine tools to make replacement parts. They use powered hoists and other equipment for lifting and moving heavy parts.

Places of Employment

About 95,000 persons worked as diesel mechanics in 1974. Many work for distributors and dealers that sell diesel engines, farm and construction equipment, and trucks. Others work for buslines, construction firms, and government agencies such as State highway departments. Some mechanics work for diesel engine manufacturers and independent repair shops that specialize in diesels.

Diesel mechanics work in all parts of the country. Jobs are concentrated in metropolitan areas.

Training, Other Qualifications, and Advancement

Diesel mechanics learn their skills in several different ways. Many begin by repairing gasoline-powered automobiles, trucks, and buses. They usually start as helpers to experienced gasoline engine mechanics, becoming skilled in 3 or 4 years. When employed by firms that use or repair diesel equipment, they receive several months of additional training in servicing this equipment. While learning to fix engines, many find it helpful to take courses in diesel equipment maintenance offered by vocational, trade, and correspondence schools.

A few mechanics learn their trade through formal apprenticeship programs. These programs, which generally last 4 years, give trainees a combination of classroom training and practical experience. Apprentices receive classroom instruction in blueprint reading, hydraulics, welding, and other subjects.

Still another method of entry is through full-time attendance at trade or technical schools that offer comprehensive training in diesel engine maintenance and repair. These programs generally last from several months to 2 years and provide classroom instruction and often practical experience. Graduates, however, usually need additional on-the-job training before they become skilled mechanics.

Experienced mechanics employed by companies that sell diesel-powered equipment are sometimes sent to special training classes conducted by engine manufacturers. In these classes, mechanics learn to maintain and repair the latest engines, using the most modern equipment.

Employers prefer trainees and apprenticeship applicants who have a high school or vocational school education and mechanical ability. Shop courses in blueprint reading, automobile repair, and machine shop work are helpful, as are courses in science and mathematics. Persons interested in becoming diesel mechanics should be in good physical condition because the work often requires lifting heavy parts.

Many diesel mechanics have to buy their own handtools. Beginners are expected to accumulate tools as they gain experience. Experienced mechanics usually have several hundred dollars invested in their tools.

Mechanics who work for organizations that operate or repair large numbers of diesel engines, such as buslines or diesel equipment distributors, may advance to a supervisory position, such as shop supervisor or service manager.

Employment Outlook

Employment of diesel mechanics is expected to increase faster than the average for all occupations through the mid-1980's. In addition to the jobs arising from employment growth, many openings will result from the need to replace experienced mechanics who transfer to other occupations, retire, or die.

Increased employment of mechanics is expected mainly because most industries that use diesel engines are expected to expand their activities in the years ahead. In addition, diesel engines will continue to replace gasoline engines in trucks, buses, and other equipment because diesels use less fuel and produce less pollution.

Most new job openings in this field will be filled by mechanics who have experience in repairing gasoline engines. Companies that replace gasoline engine equipment with diesel-powered equipment usually retain their experienced mechanics. Persons who have school training in diesel repair, but no practical experience, may be able to find jobs only as trainees.

Earnings and Working Conditions

According to a 1973-74 wage

survey covering metropolitan areas, mechanics employed by trucking companies, buslines, and other firms that maintain their own vehicles earned an average hourly wage of $5.65, more than one-third above the average for all nonsupervisory workers in private industry, except farming. Earnings in a sample of survey areas ranged from $3.68 in Austin, Tex., to $7.05 in San Francisco.

Diesel mechanics usually work 40 to 48 hours a week. Many work at night or on weekends, particularly if they work on buses, engines used in powerplants, or other diesel equipment used in serving the public. Some are subject to call for emergencies at any time. Mechanics generally receive a higher rate of pay when they work overtime, evenings, or weekends.

Most larger repair shops are pleasant places in which to work, but some small shops have poor lighting, heating, and ventilation. Diesel mechanics sometimes make repairs outdoors where breakdowns occur. If proper safety precautions are not taken, there is danger of injury when repairing heavy parts supported on jacks or hoists. In most jobs, mechanics handle greasy tools and engine parts. When making repairs, they sometimes must stand or lie in awkward positions for extended periods.

Many diesel mechanics belong to labor unions, such as the International Association of Machinists and Aerospace Workers; the Amalgamated Transit Union; the Sheet Metal Workers' International Association; the International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America; and the International Brotherhood of Electrical Workers.

Sources of Additional Information

Information about work opportunities in this trade may be available from the local office of the State employment service. Other sources of information are firms that use or service diesel-powered equipment, such as truck and buslines, truck dealers, and construction and farm equipment dealers. Additional information on careers is available from:

International Association of Machinists and Aerospace Workers, 1300 Connecticut Ave. NW., Washington, D.C. 20036.

ELECTRIC SIGN REPAIRERS

(D.O.T. 824.281)

Nature of the Work

Electric sign repairers fix neon and illuminated plastic signs that advertise business and products. Some also assemble and install signs.

Repairers do most of their work at sign locations. They replace defective wiring and burned out lamps, and patch cracks in plastic signs. They also tighten or weld parts that have been loosened by high winds and repaint beams, columns, and other framework. Repairers may repaint portions of neon tubing to make it more readable. Major repairs of faulty components, such as motors, are made in sign shops.

Repairers also do preventive maintenance and periodic inspection of signs to locate and correct defects before breakdowns occur. They check signs and remove such things as birds' nests and accumulated water. Also, motors, gears, bearings, and other parts of revolving signs may be checked, adjusted, and lubricated. Repairers sometimes suggest ways to increase the attractiveness and visibility of signs, such as changing the color of tubing, or raising the height of a sign.

Repairers use handtools and power tools, such as screwdrivers and electric drills. They also use ammeters, volt-ohm meters, and other testing devices to locate malfunctioning parts. When replacing burned out parts such as a lamp or a flasher in illuminated plastic signs, repairers may refer to wiring diagrams and charts. Their trucks are equipped with ladders and boom cranes.

Repairers usually must fill out reports by noting the date, place, and nature of service calls. They also may estimate the cost of service calls and sell maintenance contracts to sign owners.

Places of Employment

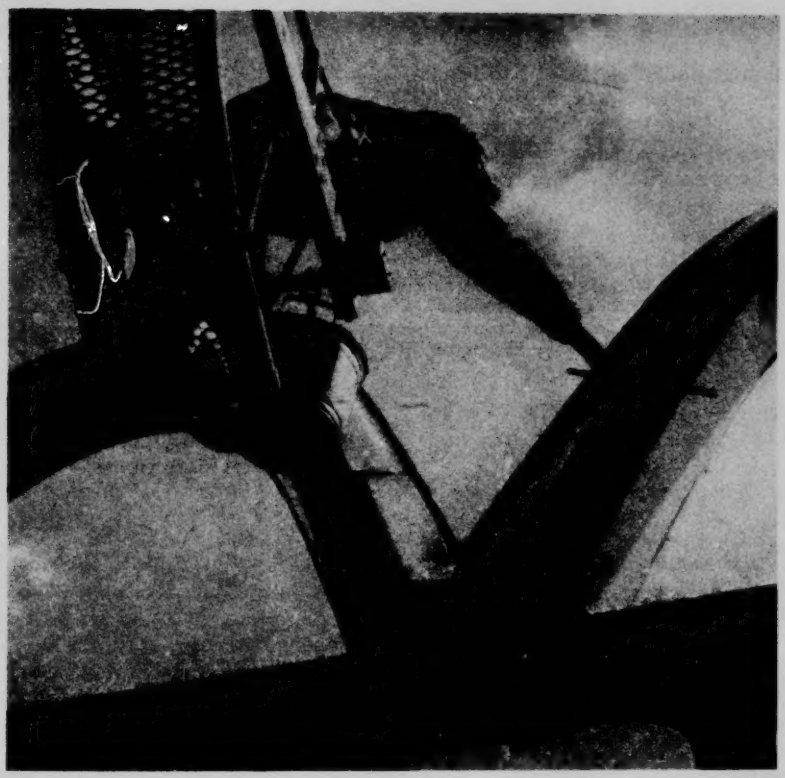
About 9,000 persons worked as electric sign repairers in 1974, primarily in small shops that manufacture, install, and service electric signs. Some also worked for independent sign repair shops.

Electric sign repairers work in every State. However, employment is concentrated in large cities and in populous States.

Training, Other Qualifications, and Advancement

Most electric sign repairers are hired as trainees and learn their trade informally on the job. They rotate through the various phases of signmaking to obtain a general knowledge of tasks—such as cutting and assembling metal and plastic signs; mounting neon tubing; wiring signs; and installing electrical parts. At least 4 years on the job are required to become a fully qualified repairer.

Some people learn the trade through sign repairer or electrician apprenticeship programs which generally last 4 years and include on-the-job training and classroom instruction in fields such as electrical theory and blueprint reading. Apprenticeship applicants generally must be at least 18 years old with a high school diploma and have mechanical aptitude and an interest in electricity.



Employers prefer to hire high school or vocational school graduates, although many repairers have less education. Courses in mathematics, science, electronics, and blueprint reading are helpful to young people who are interested in learning this trade.

Repairers need good color vision because electric wires are frequently identified by color. They also need manual dexterity to handle tools and physical strength to lift transformers, and other heavy equipment.

All electric sign repairers must be familiar with the National Electric Codes; some also must know local electric codes. Many cities require repairers to be licensed. Licenses can be obtained by passing an examination in electrical theory and its application. Repairers generally purchase their own handtools which may cost up to $100, but employers usually furnish power tools.

Highly skilled repairers may become supervisors. Because of their experience in servicing signs and dealing with customers, repairers sometimes become sign sales representatives. Also, repairers with sufficient funds can open their own sign manufacturing or repair shops.

Employment Outlook

Employment of electric sign repairers is expected to increase faster than the average for all occupations through the mid-1980's. A rapid increase in the number of signs in use will spur demand for these workers. More signs will be needed as new businesses open and old ones expand and modernize their facilities. Signs already in use also will continue to require maintenance. In addition to jobs from employment growth, some openings will arise as experienced workers retire, die or transfer to other occupations.

Earnings and Working Conditions

The earnings of electric sign repairers compare favorably with those of other skilled workers. It is estimated that the hourly wage rates of experienced repairers ranged from $2.90 to $9.10 in 1974, based on a survey of union wages and fringe benefits covering 93 cities. Apprentice rates usually start at about half the skilled repairer's hourly rate and increase every 6 months.

Most electric sign repairers work an 8-hour day, 5 days a week, and receive premium pay for overtime. They also may receive extra pay for working at heights in excess of 30 feet.

Because most signs are out-of-doors, repairers are exposed to all kinds of weather. They make emergency repairs at night, on weekends, and on holidays. Some patrol areas at night for improperly operating signs. Hazards include electrical shock, burns, and falls from high places. Safety belts, training programs emphasizing safety, and baskets on boom trucks for easy access to signs have reduced the frequency of accidents. Many electric sign repairers belong to unions, such as the International Brotherhood of Electrical Workers, the Sheet Metal Workers International Association and the International Brotherhood of Painters and Allied Trades.

Sources of Additional Information

For further information on work opportunities, contact local sign manufacturing shops, the local office of the State employment serv-

ice, or locals of the Unions previously mentioned.

General information on job opportunities, wages, and the nature of the work is available from:

National Electric Sign Association, 2625 Butterfield Rd., Oak Brook, Ill. 60521.

FARM EQUIPMENT MECHANICS

(D.O.T. 624.281 and .381)

Nature of the Work

Farm equipment mechanics service most of the equipment used to plant, cultivate, and harvest food. These craft workers maintain all types of farm machinery, including tractors, combines, hay balers, corn pickers, crop dryers, elevators, and conveyors. In addition, they may assemble new implements and machinery for farm equipment dealers or wholesalers. Sometimes, they repair dented and torn sheet metal on farm equipment.

Mechanics spend much of their time repairing and adjusting malfunctioning diesel and gas-powered tractors which have been brought to the shop. During planting or harvesting seasons, however, the mechanic may travel to the farm to make emergency repairs so that crops can be harvested before they spoil.

Mechanics also peform preventive maintenance. Periodically, they test and clean parts and tune engines. In large shops, mechanics may specialize in certain types of work, such as engine overhaul or clutch and transmission repair. They also may specialize in repairing certain types of equipment such as hay balers. Some mechanics also repair plumbing, electrical, irrigation, and other equipment on farms.

Mechanics use many simple handtools including wrenches, pliers, hammers, and micrometers. They also may use more complex testing equipment, such as a dynamometer to measure engine performance, or a compression tester to find worn piston rings or leaking cylinder valves. They may use welding equipment or power tools to repair broken parts.

Places of Employment

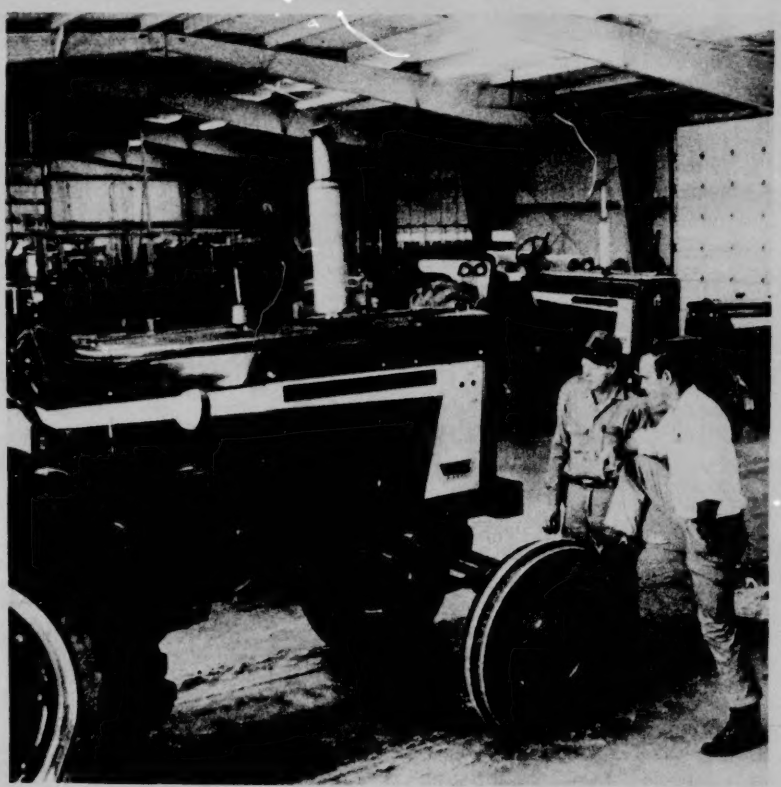
Most of the estimated 60,000 farm equipment mechanics in 1974 worked in service departments of farm equipment dealers. Other mechanics worked in independent repair shops, in shops on large farms, and in service departments of farm equipment wholesalers and manufacturers. Most farm equipment repair shops employ fewer than five mechanics, although a few dealerships employ more than 10. A small proportion of farm equipment mechanics are self-employed.

Farm equipment mechanics work in all parts of the country. Most, however, are employed in areas where agricultural activity is heaviest. Employment is concentrated in small cities.

Training, Other Qualifications, and Advancement

Most farm equipment mechanics are hired as helpers and learn the trade on the job by assisting qualified mechanics. The length of training varies with the helper's aptitude and prior experience. At least 3 years of on-the-job training usually are necessary in order to become a qualified mechanic.

More and more mechanics who enter the trade have had vocational training in rural high schools, in junior and technical colleges, or in the Armed Forces. With the



Mechanic discusses job with supervisor.

development of more complex farm implements, technical training in electronics will become more important.

A few farm equipment mechanics learn the trade by completing an apprenticeship program which lasts from 3 to 4 years and includes on-the-job as well as classroom training in all phases of farm equipment maintenance. Applicants for these programs usually are chosen from shop helpers.

Some farm equipment mechanics and trainees receive refresher training in short-term programs conducted by farm equipment manufacturers. These programs usually last several days. A company representative explains the design and function of equipment and teaches maintenance and repair on new models of farm equipment.

Employers prefer applicants who have a farm background and an aptitude for mechanical work. Employers also prefer high school graduates, but some will hire applicants who have less education. In general, employers stress previous experience or training in diesel and gasoline engines, blueprint reading, shop mathematics, hydraulics, and welding—subjects that may be learned in many high schools and vocational schools.

Persons considering careers in this field should have the strength and manual dexterity to handle tools and equipment. They should also be able to work independently with minimum supervision.

Farm equipment mechanics may advance to shop supervisor or manager of a farm equipment dealership. Some mechanics open their own repair shops.

Employment Outlook

Employment of farm equipment mechanics is expected to increase about as fast as the average for all occupations through the mid-1980's. In addition to jobs from employment growth, several hundred job opportunities will arise each year as experienced mechanics retire, die, or transfer to other occupations. Opportunities will be best for applicants who have lived or worked on farms and know how to operate farm machinery and make minor repairs.

The development of more technically advanced farm equipment, which requires greater maintenance, will increase the demand for mechanics. Moreover, as the equipment becomes more complex, farmers will be less able to make their own repairs and will have to rely more on skilled mechanics.

Earnings and Working Conditions

Average hourly wages of farm equipment mechanics ranged from $3 to $6 in 1974, based on the limited information available.

Farm equipment mechanics usually work a 44-hour week, which includes 4 hours on Saturday. During planting and harvesting seasons, however, they often work 6 to 7 days a week, 10 to 12 hours daily. In winter months, they may work fewer than 40 hours a week.

Mechanics often travel many miles to repair equipment in the field, and are exposed to all kinds of weather. They come in contact with grease, gasoline, rust, and dirt, and there is danger of injury when they repair heavy parts supported on jacks or by hoists. Engine burns and cuts from sharp edges of machinery also are possible. Farm equipment mechanics, however, have the opportunity to live and work in rural areas.

The few farm equipment mechanics who belong to labor unions are members of the International Association of Machinists and Aerospace Workers.

Sources of Additional Information

Details about work opportunities may be obtained from local farm equipment dealers and local offices of the State employment service. For general information about the occupation, write to:

Farm and Industrial Equipment Institute, 410 N. Michigan Ave., Chicago, Ill. 60611.

National Farm and Power Equipment Dealers Association, 2340 Hampton Ave., St. Louis, Mo. 63139.

INDUSTRIAL MACHINERY REPAIRERS

(D.O.T. 626. Through 631.)

Nature of the Work

Industrial machinery repairers—often called maintenance mechanics—maintain and repair machinery and other mechanical equipment used in factories. When breakdowns occur, repairers must quickly find the causes of trouble and make repairs because delays can interrupt the factory's production.

Repairers spend much time doing preventive maintenance. By regularly inspecting the equipment, oiling and greasing machines, and cleaning parts, they prevent trouble which could cause breakdowns later. They also may keep maintenance records of the equipment serviced.

The types of machinery serviced by repairers depend on the industry. For example, in the apparel industry, they may repair belts, adjust treadles, or replace motor bearings in industrial sewing machines. In printing plants, repairers maintain the presses.

Repairers often follow blueprints, lubrication charts, and engineering specifications in maintaining and fixing equipment. They also may use catalogs to order replacements for broken or defective parts. When parts are not readily available, or when a machine must be quickly returned to production, repairers

Industrial machinery repairers need agility.

may sketch a part that can be fabricated by the plant's machine shop.

Industrial machinery repairers use wrenches, screwdrivers, pliers, and other handtools, as well as portable power tools. They also may use welding equipment to mend broken metal parts.

Many of the industrial machinery repairer's duties are also performed by millwrights. (See statement on Millwrights elsewhere in the *Handbook*.)

Places of Employment

Industrial machinery repairers work in almost every industry that uses large amounts of machinery. Many of the 500,000 repairers employed in 1974 worked in the following manufacturing industries: food products, primary metals, machinery, chemicals, fabricated metal products, transportation equipment, paper, and rubber.

Because industrial machinery repairers work in a wide variety of plants, they are employed in every section of the country. However, employment is concentrated in heavily industrialized areas.

Training, Other Qualifications, and Advancement

Most workers who become industrial machinery repairers start as helpers and pick up the skills of the trade informally, through several years of experience. Others learn the trade through formal apprenticeship programs. Apprenticeship training usually lasts 4 years and consists of both on-the-job training and related classroom (or correspondence shool) instruction in subjects such as shop mathematics, blueprint reading, and welding. Upgrade examinations may be administered periodically to determine the repairer's ability to maintain more advanced machinery.

Mechanical aptitude and manual dexterity are important qualifications for workers in this trade. Good physical condition and agility also are necessary because repairers sometimes have to lift heavy objects or do considerable climbing to reach equipment located high above the floor.

High school courses in mechanical drawing, mathematics, and blueprint reading are recommended for those interested in entering this trade.

Employment Outlook

Employment of industrial machinery repairers is expected to increase much faster than the average for all occupations through the mid-1980's. In addition to jobs from employment growth, many openings will result from the need to replace experienced repairers who retire, die, or transfer to other occupations.

More repairers will be needed to take care of the growing amount of machinery used in manufacturing, coal mining, oil exploration, and other industries. In addition, as machinery becomes more complex, repair work and preventive maintenance will become more essential.

Earnings and Working Conditions

According to a 1973-74 survey of metropolitan areas, hourly wages for industrial machinery repairers averaged $5.24—nearly one-third higher than the average for all nonsupervisory workers in private industry, except farming. Average

hourly earnings of industrial machinery repairers in 13 areas that represent various regions of the country are shown in the following tabulation:

Metropolitan area	*Hourly rate*
Detroit	$6.42
San Francisco–Oakland	6.14
Chicago	5.62
Seattle–Everett	5.57
Phoenix	5.53
New York	5.41
Houston	5.36
Baltimore	5.35
Minneapolis–St. Paul	5.32
Pittsburgh	5.26
South Bend	5.26
Boston	5.00
Miami	4.39

Industrial machinery repairers are not usually affected by seasonal changes in production. During slack periods when some plantworkers are laid off, repairers are often retained to do major overhaul jobs.

In emergencies, industrial machinery repairers may be called to the plant during off-duty hours. In some factories, they may work nights and weekends.

Repairers may work in stooped or cramped positions or from the tops of ladders, and are subject to common shop injuries such as cuts and bruises. Goggles, metal-tip shoes, safety helmets, and other protective devices help prevent injuries.

Labor unions to which most industrial machinery repairers belong include the United Steelworkers of America; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Association of Machinists and Aerospace Workers; and the International Union of Electrical, Radio and Machine Workers.

Sources of Additional Information

Information about employment and apprenticeship opportunities in this field may be available from local offices of the State employment service or the following organizations:

International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America, 8000 East Jefferson Ave., Detroit, Mich. 48214.

International Union of Electrical, Radio, and Machine Workers, 1126-16th St. NW., Washington, D.C. 20036.

INSTRUMENT REPAIRERS

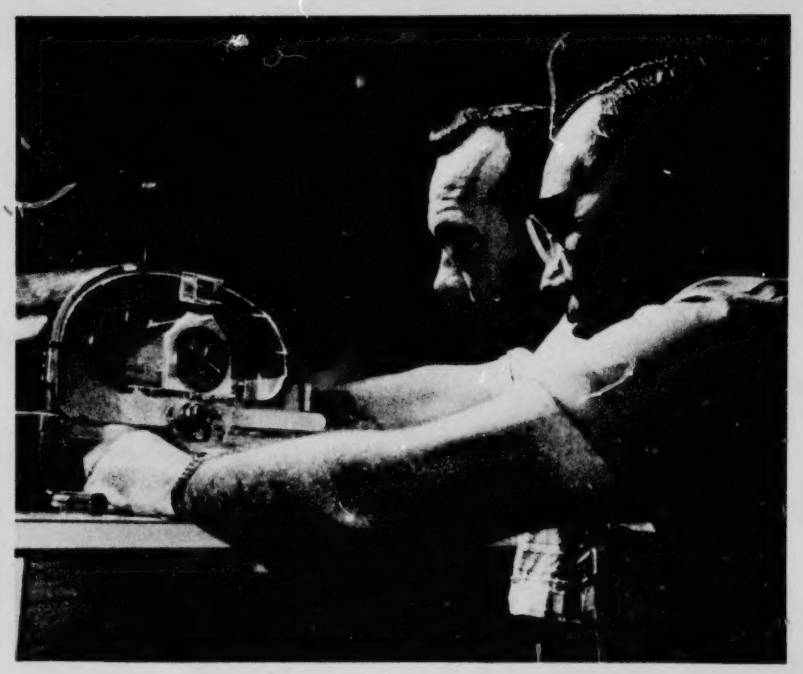
(D.O.T. 710.131, 710.281, 729.281, 823.281, and 828.281)

Nature of the Work

Instrument repairers, often called instrument technicians, service instruments that are used to measure, record, analyze, and control product output and processes in nearly all areas of research and industry. Most repairers service a variety of instruments; others specialize in electronic, hydraulic, or pneumatic instruments. Some repairers install and test new instruments and advise operators on how to use and care for them; others may determine the extent and cost of needed repairs.

Instrument repairers perform preventive maintenance by correcting weakened or defective parts that might break down and cause production losses. They also clean, lubricate, and adjust instruments.

When an instrument-controlled system is not working correctly, repairers determine whether the trouble is caused by the instrument or by other equipment. They may take apart faulty instruments and examine and test the parts for defects. They use testing equipment, such as pressure and vacuum gauges, speed counters, voltmeters, potentiometers, ammeters, and oscilloscopes. Readings shown on test equipment are compared with readings that would be shown if the instruments were operating properly.



Instrument repairer adjusts vacuum control.

Repairers work either at the site of trouble or in repair shops. They may perform major overhauls, replace worn or damaged parts, or make minor repairs, such as resoldering loose connections. They use handtools such as screwdrivers and wrenches, and bench tools such as jewelers' lathes, pin vises, and ultrasonic cleaners for small metal parts. In some companies, they operate drill presses, polishers, and other machine tools to make new parts or to change standard parts to fit particular instruments. When an instrument must be set precisely, they may use jewelers' loupes, micrometers, or microscopes. Repairers frequently use information from instruction books, maintenance manuals, electrical diagrams, and blueprints.

Places of Employment

About 110,000 persons worked as instrument repairers in 1974. Most of them worked for gas and electric utilities, petroleum and chemical plants, and manufacturers of instruments and industrial controls. Large numbers of instrument repairers also worked for airlines and manufacturers of pulp and paper, metals, rubber, aircraft and missiles, and automobiles. A few thousand worked for Federal agencies, mainly the Air Force, Navy, and Army.

Training, Other Qualifications, and Advancement

At least 4 years of on-the-job training and study are usually required in order to become an instrument repairer. However, training time depends upon individual ability, previous experience and training, and complexity of the instruments serviced.

Instrument repairers generally are selected from production employees or hired as trainees. They may learn their trade informally on the job or through formal apprenticeship. Apprenticeship programs generally last 4 years and, in addition to work experience, may include courses in instrumentation theory, mathematics, blueprint reading, physics, electronics, and chemistry. These courses may be taken by correspondence or at local schools.

Some people train for instrument repair work in technical institutes and junior colleges. Programs offered by these schools usually last 2 years and emphasize basic engineering courses, science, and mathematics. Instruments are becoming more complex, and technical school training is becoming a more essential requirement for instrument repair work. This kind of training will provide a better base for advancement opportunities. Increasingly, these repairers may be performing duties formerly done by engineers.

Armed Forces technical schools also offer training in instrument servicing. Skills acquired in this way may help a person qualify for a civilian job as an instrument repairer.

Several instrument manufacturers offer specialized training to experienced repairers employed by their customers. This training may last from 1 week to 9 months, depending upon the number and complexity of the instruments. Courses are given in theory, maintenance, and operation of the instruments produced by these manufacturers. Instrument repairers also keep up with new developments in their field by reading trade magazines and manufacturers' service manuals.

Trainees or apprentices generally must be high school graduates. Courses in algebra, trigonometry, physics, chemistry, electronics, machine shop, and blueprint reading are considered particularly useful. Some employers give tests to applicants to determine their mechanical aptitude. Good eye-hand coordination and finger dexterity are needed to handle delicate parts. The ability to work without close supervision also is important. Building and maintaining a "ham" radio station or a stereo is good experience for an individual planning to become an instrument repairer, particularly for electronic instrumentation.

Instrument repairers having leadership ability may become supervisors in maintenance and repair departments. Some may advance to positions as service representatives for instrument manufacturers. A few instrument repairers become engineering assistants or engineers. A good knowledge of electronics greatly increases advancement possibilities because of the growing use of electronic circuitry in instruments.

Employment Outlook

Employment of instrument repairers is expected to increase faster than the average for all occupations through the mid-1980's. In addition to job openings caused by employment growth, a few thousand openings will result annually from the need to replace experienced repairers who retire, die, or transfer to other occupations.

Additional instrument repairers will be needed because the use of more technically sophisticated instruments for measurement, analysis, and control is expected to increase. Industrial instruments for process control in a number of industries including steel, food, and rubber are expected to increase substantially. In addition, more instruments will be needed for research laboratories, aircraft and missiles, automotive repair shops, and optical applications.

Opportunities for instrument repairers are expected to be particularly favorable in the petroleum, chemicals, and medical supplies industries, due to increased emphasis in the areas of energy conservation and exploration, air

and water pollution monitoring, and medical diagnosis.

Earnings and Working Conditions

Data from several union contracts in the paper and petroleum industries indicated that many instrument repairers received between $4.24 and $5.94 an hour in 1974. Those specializing in the repair of electronic instruments and systems often receive higher wages. Instrument repairers employed by Federal agencies receive rates comparable to those in private industry.

Most instrument repairers work a 40-hour, 5-day week. Those employed in plants that operate around the clock may work on any of three shifts or rotate among shifts. Repairers also may be called to work with emergency crews nights, Sundays, and holidays.

Work settings for instrument repairers vary from factory floors amid noise, heat, and fumes to quiet, clean well-lighted shops. In some industries, such as chemicals, petroleum, and steel, repairers may have to work outdoors. Those employed by instrument manufacturers may travel frequently.

Many instrument repairers belong to unions, including the International Association of Machinists and Aerospace Workers; International Brotherhood of Electrical Workers; United Paperworkers International Union; International Chemical Workers Union; International Union of Electrical, Radio and Machine Workers; International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America; Oil, Chemical and Atomic Workers International Union; United Steelworkers of America; and Utility Workers Union of America.

Sources of Additional Information

The local office of the State employment service may be a source of information about training and employment opportunities for persons who wish to enter this occupation. Additional information is available from:

Instrument Society of America, 400 Stanwix St., Pittsburgh, Pa. 15222.

Scientific Apparatus Makers Association, 1140 Connecticut Ave. NW., Washington, D.C. 20036.

Inquiries concerning positions with the Federal Government should be made at the regional offices of the U.S. Civil Service Commission.

JEWELERS

(D.O.T. 700.281 and .381)

Nature of the Work

Jewelers make rings, necklaces, and other ornaments out of gold, silver, diamonds, and other precious metals and gems. The jeweler's work is very delicate and must be done with care and precision to safeguard expensive materials.

Jewelers follow either their own designs or those created by designers. They outline the design on metal such as gold or silver, and then cut, fit, and shape each part. After preparatory polishing, they solder parts together to form the finished piece. Designs are carved in the metal and rubies, opals, or other stones are mounted. In their work jewelers use files, saws, hammers, punches, and a variety of other small handtools. When doing very precise work, they use a magnifying glass or eye "loupe."

Generally, jewelers specialize in a particular kind of jewelry, or in a particular operation, such as modelmaking, designing, engraving, polishing, or stone setting. Some specialize in repair work such as enlarging and reducing rings, resetting stones, and soldering broken parts.

Costume jewelry and some kinds of precious jewelry are mass produced by factory workers using assembly line methods. The metal usually is melted and cast in a mold or shaped with a die. Skilled jewelers are needed, however, to perform finishing operations, such as engraving and stone setting.

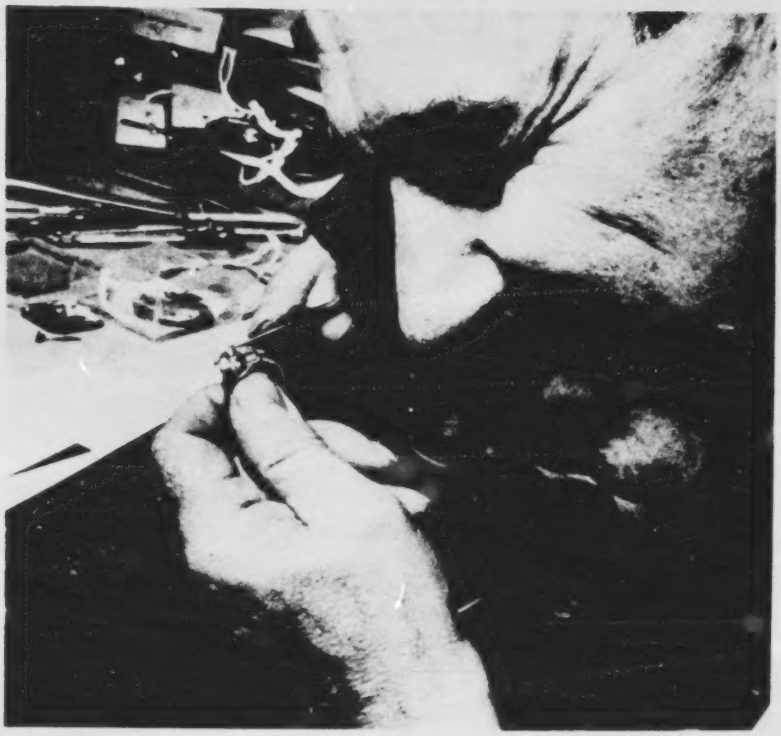
Many jewelers own jewelry stores or shops that make and repair jewelry. In addition to working on jewelry, these small business people hire employees, order and sell merchandise, and handle other managerial duties.

Places of Employment

About 18,000 people had jobs as jewelers in 1974, one-third of whom were self-employed and owned retail jewelry stores and repair shops. The remainder worked in jewelry stores, repair shops, and factories. Jewelry stores and repair shops are located throughout the country, but are concentrated in metropolitan areas. More than half of the precious jewelry production is found in New York City and about three-fourths of the costume jewelry factories are in Rhode Island and southeastern Massachusetts.

Training, Other Qualifications, and Advancement

Jewelers' skills can be learned through informal on-the-job training—the most common way—or through formal apprenticeship programs. Beginners usually can qualify as jewelry repairers after about a year on the job. Depending on the particular skill to be learned, apprenticeship programs for jewelry makers usually take from 3 to 4 years. For example, 3 years are required to become a colored-stone setter and 4 years to qualify as a diamond setter. Apprenticeship programs include on-the-job training as well as classroom instruction in design, quality of precious



The jeweler's work is very delicate.

stones, chemistry of metals, and related subjects.

Jewelry factories offer the best opportunities for a young person to acquire all-round skills. Repair shops also offer training opportunities, but their small size—many employ only one or two persons—limits the number of trainees.

A high school education is desirable for young people entering the trade. Courses in chemistry, mechanical drawing, and art are particularly useful. A growing number of jewelers are graduates of technical schools which offer instruction for one-half to 3 years in watch and jewelry repair, and jewelry design and construction.

The precise and delicate nature of jewelry work requires finger and hand dexterity, good eye-hand coordination, patience, and concentration.

In manufacturing, jewelry workers can advance to supervisors; in stores, they may become managers. Some jewelers open their own jewelry stores or repair shops.

A substantial financial investment is required in order to open a jewelry store, and the field is highly competitive. Jewelers who plan to open their own stores should have experience in selling jewelry. Those who can repair watches have an advantage, since watch repairs account for much of the business in small stores.

Employment Outlook

Employment of jewelers is expected to show little or no change through the mid-1980's. Though the demand for jewelry will increase as population grows, and as rising incomes enable people to spend more on luxuries, improved production methods will enable jewelry factories to meet the increased demand without hiring additional employees. However, several hundred job openings will occur each year as experienced workers retire, die, or transfer to other occupations.

For the jobs that do become available, most employers likely will give first consideration to applicants who have completed technical school courses in jewelry design, construction, and repair.

Earnings and Working Conditions

According to limited information available, weekly earnings of experienced jewelers ranged from about $5 to $7 an hour in 1974. Those in business for themselves usually earned much more.

Most jewelers in stores and repair shops work 40 to 48 hours a week. Some in factories work 35 hours a week.

Skilled jewelers usually work in well-lighted and well-ventilated surroundings. The work is sometimes recommended for the physically handicapped since the employee is seated and exerts little energy.

Sources of Additional Information

For information on job opportunities in jewelry manufacturing, contact:

Manufacturing Jewelers and Silversmiths of America, Inc., 340 Howard Building, 155 Westminster St., Providence, R.I. 02903.

For information on opportunities in jewelry stores and a listing of jewelry technical schools, contact:

Retail Jewelers of America, 10 Rooney Circle, West Orange, N.J. 07052.

LOCKSMITHS

(D.O.T. 709.281)

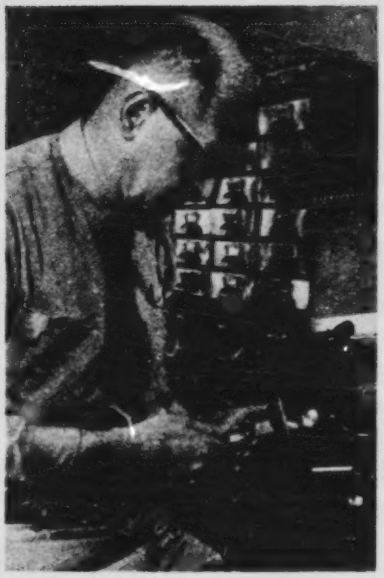
Nature of the Work

Locksmithing is an ancien trade—so old, in fact, that archeologists have found evidence of key-operated wooden locks made for Egyptian royalty as early as 2000 B.C. For many centuries, the locksmith's talents were available to only a relatively few who could afford the locks of the day, sometimes elaborate, if none too foolproof. In 1861, the pin tumbler lock was invented and a mass-production method developed that made these locks nearly as common as doors themselves. The locksmith came into demand as never before.

Today's locksmiths spend much of their time helping people who have locked themselves out of their cars, homes, and businesses. If the key has been left inside the car or house, for example, they may simply pick the lock. If, on the other hand, the keys are lost, new ones must be made. To do this, the locksmith will first try to obtain identifying key code numbers so that he can cut duplicates of the original key. Code numbers for a car's keys, for example, may be obtained by consulting the dealer who sold the car, or by checking the owner's bill of sale. Keys also can be duplicated by impression. In this case, the locksmith places a blank key in the lock and, by following marks left on the blank, files notches in it until it works.

Combination locks offer a special challenge. Locksmiths sometimes open them by touch, that is, by rotating the dial and feeling the vibrations when the wheels come into place. If all else fails, a hole may be drilled through the lock to open it. Finally, locksmiths repair damaged locks by replacing tumblers, springs, and other parts.

An important part of the locksmith's job is to recommend



Locksmith repairs door lock.

security measures to customers. For example, they may advise a firm to rekey its locks periodically. To rekey, locksmiths change the locking mechanism to fit new key codes, thus making the old keys useless. Rekeying a master system is one of the most complicated and time-consuming jobs handled by a locksmith. In a master system, some keys must open all doors; others open various combinations (for example, all doors on one floor); still others are individual keys for each door.

Some locksmiths install and repair electronic burglar alarms and surveillance systems which signal police or firefighters when break-ins or fires occur. A basic knowledge of electricity and electronics is needed to install and repair these systems. Much of the work is done by specialists called protective-signal repairers, rather than by locksmiths.

Locksmiths use screwdrivers, pliers, tweezers, and electric drills in their work, as well as special tools such as lockpicks. They make original and duplicate keys on keycutting machines. To guide them in their work, they refer to manuals that describe the construction of various locks.

Places of Employment

Most of the estimated 9,000 locksmiths in 1974 worked for locksmith shops. Many operated their own businesses. Locksmith shops typically employ one to three locksmiths; few employ more than five. Some locksmiths worked in hardware and department stores that offered the public locksmith services; other worked in government agencies and large industrial plants. A small number worked for safe and lock manufacturers.

Although most jobs will be found in big cities, locksmiths work in virtually every part of the country. Locksmithing in small towns, however, is usually a part-time job, often combined with other work, such as fixing lawnmowers, guns, and bicycles.

Training, Other Qualifications, and Advancement

The skills of this trade are learned primarily through on-the-job training under experienced locksmiths. First, beginners may learn to duplicate keys and make keys from codes. Later, they learn to open, repair, and install locks, and finally, to work on safes. Generally, a beginner needs about 4 years of on-the-job training to qualify as a locksmith. Additional training is needed to service electronic security systems.

Employers look for young people who have mechanical aptitude, good hand-eye coordination, and manual dexterity. A neat appearance and a friendly, tactful manner also are important, since the locksmith has frequent contacts with the public. Employers usually will not hire applicants who have been convicted of crimes.

Although high school graduates

are preferred, many employers will hire applicants with less education. High school courses in machine shop, mechanical drawing, electronics, and mathematics are helpful. Completion of a correspondence school course in locksmithing increases the chances of getting a trainee job.

Some cities require locksmiths to be licensed. To obtain a license, the applicant generally must be fingerprinted and pay a fee. However, specific requirements vary from city to city. Information on licensing may be obtained from local governments.

To keep up with new developments in their field, locksmiths read monthly technical journals or attend training classes at the annual convention of Associated Locksmiths of America.

Locksmiths can advance to shop supervisors—positions found, however, only in the larger shops. Experienced locksmiths also can go into business for themselves with relatively little capital. Many do business from their homes.

Employment Outlook

Employment in this relatively small occupation is expected to grow faster than the average for all occupations through the mid-1980's. In addition to the need to fill new positions, a few hundred openings will arise each year as experienced locksmiths retire, die, or transfer to other occupations.

Employment of locksmiths is expected to increase as a result of population growth and a more security-conscious public. Also, many businesses feel that conventional locks and other security devices are not adequate and are having more complex equipment installed. Opportunities will be particularly favorable for locksmiths who know how to install and service electronic security systems. Use of such systems has expanded greatly in recent years, and still greater growth is expected in the future. Opportunities also will be favorable for locksmiths who are willing to work at night to handle emergencies.

Earnings and Working Conditions

Experienced locksmiths earned from $4 to $6.50 an hour in early 1974, according to the limited information available; many self-employed locksmiths earned even more. Trainees usually started at about $2 an hour, with periodic raises during training.

Most locksmiths receive an hourly rate or weekly salary, although some work on a commission basis, receiving a percentage of the money they collect; their earnings depend on the amount of work available and how quickly they complete it.

Locksmiths generally work year round. Most work 40 to 48 hours a week; even longer hours are common among the selfemployed. The locksmith may be called at night to handle emergencies, though in many shops the responsibility to be "on call" is rotated among the staff.

Locksmiths do considerable driving from job to job. At times, they must work outside in bad weather and occasionally work in awkward positions for long periods. However, locksmithing is cleaner work than that of most mechanical trades and is comparatively free from the danger of injury.

Sources of Additional Information

Details about training and work opportunities may be available from local locksmith shops and local offices of the State employment service. General information about the occupation is available from:

Associated Locksmiths of America, Inc., 3003 Live Oak St., Dallas, Tex. 75204.

MAINTENANCE ELECTRICIANS

(D.O.T. 825.281 and 829.281)

Nature of the Work

Maintenance electricians keep lighting systems, transformers, generators, and other electrical equipment in good working order. They also may install new electrical equipment.

Duties vary greatly, depending on where the electrician is employed. Electricians who work in large factories may repair particular items such as motors and welding machines. Those in office buildings and small plants usually fix all kinds of electrical equipment. Regardless of location, electricians spend much of their time doing preventive maintenance—periodic inspection of equipment to locate and correct defects before breakdowns occur. When trouble occurs, they must find the cause and make repairs quickly to prevent costly production losses. In emergencies, they advise management whether continued operation of equipment would be hazardous, necessitating a shutdown.

Maintenance electricians make repairs by replacing items such as fuses, circuit breakers, or switches. When installing new or replacing existing wiring, they splice wires and cut and bend conduits (pipes) through which the wires are run.

Maintenance electricians sometimes work from blueprints, wiring diagrams, or other specifications. They use meters and other testing devices to locate faulty equipment. To make repairs they use pliers, screwdrivers, wirecutters, drills, and other tools.

Places of Employment

An estimated 280,000 maintenance electricians were employed in 1974. More than half of them worked in manufacturing indus-

tries; large numbers worked in plants that make automobiles, machinery, chemicals, aluminum, and iron and steel. Many maintenance electricians also were employed by public utilities, mines, railroads, and by Federal, State, and local governments.

Maintenance electricians are employed in every State. Large numbers work in heavily industrialized States such as California, New York, Pennsylvania, Illinois, and Ohio.

Training, Other Qualifications, and Advancement

Most maintenance electricians learn their trade on the job or through formal apprenticeship programs. A relatively small number learn the trade in the Armed Forces. Training authorities generally agree that apprenticeship gives trainees more thorough knowledge of the trade and improved job opportunities during their working life. Because the training is comprehensive, people who complete apprenticeship programs qualify either as maintenance or construction electricians.

Apprenticeship usually lasts 4 years, and consists of on-the-job training and related classroom instruction in subjects such as mathematics, electrical and electronic theory, and blueprint reading. Training may include motor repair, wire splicing, installation and repair of electronic controls and circuits, and welding and brazing.

Although apprenticeship is the preferred method of training, many people learn the trade informally on the job by serving as helpers to skilled maintenance electricians. Helpers begin by doing simple jobs such as replacing circuit breakers and switches and, with experience, advance to more complicated jobs such as splicing and connecting wires. They eventually get enough experience to qualify as electricians. This method of learning the trade, however, may take more than 4 years.

Persons interested in becoming maintenance electricians can obtain a good background by taking high school or vocational school courses in electricity, electronics, algebra, mechanical drawing, shop, and science. To qualify for an apprenticeship program, an applicant must be at least 18 years old and usually must be a high school or vocational school graduate with 1 year of algebra.

Although physical strength is not essential, manual dexterity, agility, and good health are important. Good color vision is necessary because electrical wires frequently are identified by color.

Because the electrician's craft is subject to constant technological change, many experienced electricians continue to learn new skills. For example, some maintenance electricians who entered the trade years ago must now learn basic electronics.

All maintenance electricians should be familiar with the National Electric Code and local building codes. Many cities and counties require maintenance electricians to be licensed. Electricians can get a license by passing an examination that tests their knowledge of electrical theory and its application.

Some maintenance electricians become supervisors. Occasionally, they advance to jobs such as plant electrical superintendent or plant maintenance superintendent.

Employment Outlook

Employment of maintenance electricians is expected to increase

faster than the average for all occupations through the mid-1980's. This growth will stem from increased use of electrical and electronic equipment by industry. In addition to the jobs from employment growth, a few thousand openings will arise each year to replace experienced electricians who retire, die, or transfer to other occupations.

Growth in the number of job openings is expected to be fairly steady in the years ahead since the demand for maintenance electricians is not very sensitive to ups and downs in the economy. At times when construction activity is depressed, however, beginners may face competition for job openings because some unemployed construction electricians apply for these openings.

Earnings and Working Conditions

Earnings of maintenance electricians compare favorably with those of other skilled workers. In early 1974, based on a survey of metropolitan areas, maintenance electricians averaged $5.64 an hour, ranging from $3.74 in Manchester, N.H. to $6.21 in Chicago. In about four-fifths of the cities surveyed, hourly averages for these workers ranged from $4.50 to $6.

Apprentices start at about 60 percent of the skilled electrician's hourly pay rate and receive increases every 6 months.

During a single day, an electrician may repair equipment both in a clean, airconditioned office and on the factory floor, surrounded by the noise, oil, and grease of machinery. Electricians often climb ladders or work on scaffolds in awkward or cramped positions.

Because maintenance electricians work near high-voltage industrial equipment, they must be alert and accurate. Errors in wiring installations could endanger both the electrician and other employees. Safety principles, which are a part of all electrician training programs, have reduced the frequency of accidents. Electricians are taught to use protective equipment and clothing, to respect the destructive potential of electricity, and to fight small electrical fires.

Among unions organizing maintenance electricians are the International Brotherhood of Electrical Workers; the International Union of Electrical, Radio and Machine Workers; the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America (Ind.); and the United Steelworkers of America.

Sources of Additonal Information

Information about apprenticeships or other work opportunities in the trade is available from local firms that employ maintenance electricians, and from local union-management apprenticeship committees. In addition, the local office of the State employment service may provide information about training opportunities. Some State employment service offices screen applicants and give aptitude tests.

MOTORCYCLE MECHANICS

(D.O.T. 620.281 and .384)

Nature of the Work

Almost 5 million Americans own motorcycles and motor scooters. Although many cycling enthusiasts repair their own vehicles, most rely on skilled mechanics.

Motorcycles, like automobiles, need periodic servicing to operate at peak efficiency. Spark plugs, ignition points, brakes, and many other parts frequently require adjustment or replacement. This routine servicing represents the major part of the mechanic's work.

The mark of a skilled mechanic is the ability to diagnose mechanical and electrical problems and to make necessary repairs in a minimum of time. In diagnosing problems, the mechanic first obtains a description of the symptoms from the motorcycle owner, and then runs the engine or test-rides the machine. The mechanic may have to use special testing equipment and disassemble some components for further examination. After pinpointing the problem, the mechanic makes needed adjustments or replacements. Some jobs require only the replacement of a single item, such as a carburetor or generator, and may be completed in less than an hour. In contrast, an overhaul may require several hours, as the mechanic must disassemble and reassemble the engine to replace worn valves, pistons, bearings, and other internal parts.

Mechanics use common handtools such as wrenches, pliers, and screwdrivers, as well as special tools for getting at "hard to remove parts" such as flywheels and bearings. They also use compression gauges, timing lights, and other kinds of testing devices. Hoists are used to lift heavy motorcycles.

Most mechanics specialize in servicing only a few of the more than 30 brands of motorcycles and motor scooters. In large shops, some mechanics specialize in overhauling and rebuilding engines and transmissions, but most are expected to perform all kinds of repairs. Mechanics may occasionally repair minibikes, go-carts, snowmobiles, outboard motors, lawnmowers, and other equipment powered by small gasoline engines.

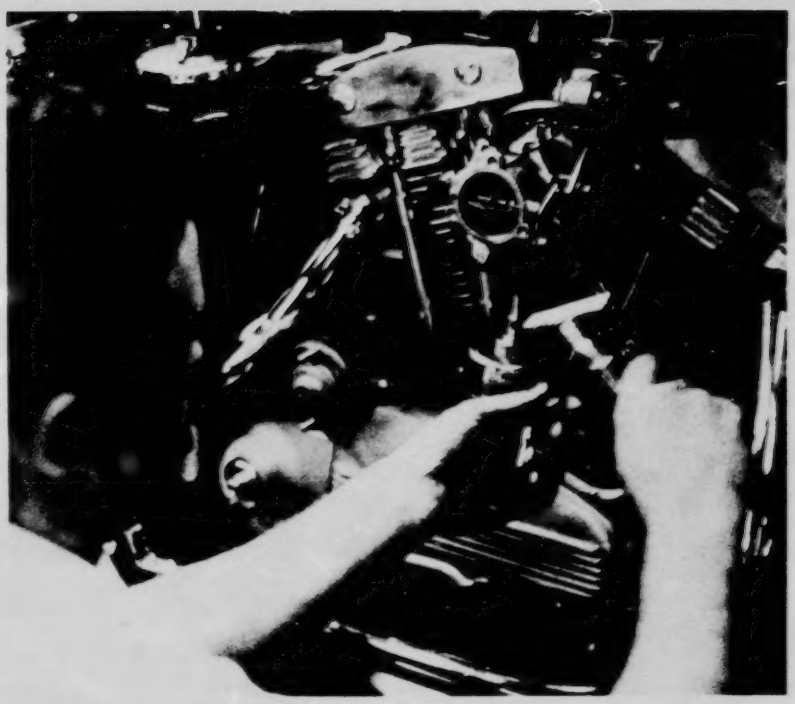
Places of Employment

About 11,000 persons had full-

time jobs as motorcycle mechanics in 1974, and a few thousand more had part-time jobs. Most mechanics work for motorcycle dealers. Others work for city governments to maintain police motorcycles. A small number of mechanics work for firms that specialize in modifying or "customizing" motorcyles. Most shops employ fewer than five mechanics.

Motorcycle mechanics work in every State and major city. About half work in 9 States: California, Michigan, Texas, Ohio, Pennsylvania, Illinois, Florida, Minnesota, and Indiana.

Mechanics who specialize in repairing motorcycles work mainly in metropolitan areas. In smaller cities, motorcycles frequently are repaired by owners or managers of motorcycle dealerships or by mechanics who repair all kinds of equipment powered by small gasoline engines.



Motorcycle mechanic repairs carburetor.

Training, Other Qualifications, and Advancement

Motorcycle mechanics usually learn their trade on the job, picking up skills from experienced workers. Initially, trainees learn to uncrate, assemble, and road-test new motorcycles. Next, they learn routine maintenance jobs such as adjusting brakes, spark plugs, and ignition points. As trainees gain experience, they progress to more difficult tasks such as repairing electrical systems and overhauling engines and transmissions. Generally, 2 to 3 years of training on the job are necessary before trainees become fully qualified mechanics.

Trainees usually accumulate handtools as they gain experience. Many mechanics have several hundred dollars invested in tools.

Employers sometimes send mechanics and experienced trainees to special training courses conducted by motorcycle manufacturers and importers. These courses, which may take 2 weeks, are designed to upgrade the worker's skills and provide information on repairing new models.

When hiring trainees, employers look particularly for cycling enthusiasts who have gained practical experience by repairing their own motorcycles. However, many employers will hire trainees with no riding experience if they have mechanical aptitude and show an interest in learning the work. Trainees must be able to obtain a motorcycle driver's license.

Most employers prefer high school graduates, but will accept applicants with less education. Courses in small engine repair—offered by some high schools and vocational schools—generally are helpful, as are courses in automobile mechanics, science, and mathematics. Many motorcycle dealers employ students to help assemble new motorcycles and perform minor repairs.

Public schools in some large cities offer post secondary and adult education in small engine and motorcycle repair. Some technical schools have training programs for motorcycle mechanics. Many junior and community colleges offer courses in motorcycle repair.

Skills learned through repairing motorcycles can be transferred to other fields of mechanical work. For example, since all internal combustion engines are similar, a motorcycle mechanic can become an automobile or diesel mechanic after some additional training. However, such a transfer would not necessarily mean higher earnings.

Motorcycle mechanics have limited advancement possibilities. Those with supervisory ability may advance to service manager and, eventually, to general manager in large dealerships. Those who have the necessary capital may become dealers.

Employment Outlook

Employment in this relatively small occupation is expected to grow much faster than the average for all occupations through the mid-1980's. Many additional openings will arise from the need to replace experienced mechanics who retire, die, or transfer to other fields of work.

Underlying the anticipated growth in the number of motorcyle mechanics is the continued growth in the number of motorcycles. Increases in the young adult population and in personal income levels will create a demand for more motorcycles, and additional mechanics will be needed to maintain these machines. Also, growth in the numbers of minibikes and snowmobiles will stimulate the demand for mechanics.

Opportunities for employment will be best in larger dealerships, most of which are located in the suburbs of metropolitan areas. Many motorcycle dealers in small cities do not have enough business to hire full-time trainees, but part-time or summer jobs may be available.

Earnings and Working Conditions

Earnings of motorcycle mechanics and trainees vary widely and depend on level of skill, geographic location, and employer. Limited information indicates that experienced mechanics employed by motorcycle dealers earned between $3 and $10 an hour in late 1974. Generally experienced mechanics earn 2 to 3 times as much as trainees.

Some mechanics receive an hourly rate or a weekly salary. Others receive a percentage—usually about 50 percent—of the labor cost charged to the customer. If a mechanic is paid on a percentage basis, income depends on the amount of work assigned and how rapidly the mechanic completes it. Frequently, trainees are paid on a piecework basis when uncrating and assembling new motorcycles. At other times, they are paid an hourly rate or weekly salary.

Motorcycling increases sharply as the weather grows warmer. As a result, most mechanics work more than 40 hours a week during the summer. Many temporary workers hired to help handle the increased work load work only part time, and are laid off in the fall. However, a large proportion of these are either students or workers with other jobs.

Motorcycle shops generally are well-lighted and ventilated, but are noisy when engines are being tested. The work is not hazardous, although mechanics are subject to cuts, bruises, and other minor injuries. Since motorcycles are relatively lightweight and have easily accessible parts, mechanics rarely do heavy lifting or work in awkward positions.

A small percentage of motorcycle mechanics are members of the International Association of Machinists and Aerospace Workers.

Sources of Additional Information

For further information regarding employment opportunities and training, contact local motorcycle dealers or the local office of the State employment service.

PIANO AND ORGAN TUNERS AND REPAIRERS

(D.O.T. 730.281, .381, and 829.381)

Nature of the Work

There are four different kinds of piano and organ tuners and repairers: piano tuners, piano technicians, pipe organ technicians, and electronic organ technicians. According to their skills, they tune, repair, or rebuild pianos and organs. They usually begin their trade by learning how to tune these keyboard instruments.

Piano tuners (D.O.T. 730.381) adjust piano strings so that they will be in proper pitch and sound musically correct. There are approximately 220 strings in the standard 88-key piano. After muting the strings on either side, the tuner uses a tuning hammer (also called a tuning lever or wrench) to tighten or loosen the string being tested until its frequency matches that of a standard tuning fork. The other strings are tuned in relation to the starting string.

Sometimes the tuner has to make minor repairs, such as replacing worn or broken strings. However, major repairs are made by piano technicians.

In addition to knowing how to tune a piano, *piano technicians* (D.O.T. 730.281) can detect and correct other problems that may affect its sound. Technicians talk with the customer to get an idea of what is wrong and then go to work to find out why. Once they find what the problem is, they make the needed repairs or adjustments. For example, they may have to realign hammers that do not strike the strings just right or replace moth-eaten felt on the hammers. To dismantle and repair pianos, technicians use common handtools as well as special ones such as regulating tools, repinning tools, and key leveling devices.

Although organs and pianos look somewhat alike, they function differently, and few technicians work on both instruments. Moreover, organ technicians specialize in either electronic or pipe organs.

Pipe-organ technicians (D.O.T. 730.381) install, tune, and repair organs that make music by forcing air through one of two kinds of pipes—flue pipes or reed pipes. The tone in a flue pipe, like that in a

whistle, is made by air forced through an opening. The reed pipe makes its tone by vibrating a brass reed in the air current.

Like piano tuners, organ technicians use their ears and tuning forks to put an organ in good voice. To tune a flue pipe, the technician moves a metal slide which increases or decreases the pipe's "speaking length." A reed pipe is tuned by adjusting the length of the reed. A day or more may be needed to finish one of these jobs, because most organs have hundreds of pipes. Some workers specialize only in tuning, and do not have the all-round skills of a technician.

Most pipe organs are very large and complex, and are assembled on site in places like churches and auditoriums. Technicians install air chests, blowers, airducts, organ pipes, and other components. They follow the designer's blueprints and use a variety of hand and power tools to assemble components. Technicians may work in teams or be assisted by helpers. A job may take several weeks or even months, depending on the size of the organ.

Technicians may also maintain organs on a regular basis, returning every 3 or 4 months to tune them and make other routine adjustments.

Electronic organ technicians (D.O.T. 829.381) have very different duties from those of pipe organ technicians. They use special electronic test equipment to tune and to check tone and amplifications. Some electronic organs do not require tuning. Those that do are fairly simple to tune. However, these organs may break down due to loose connections, faulty transistors, dirty contacts, and other problems. When routine checks do not find the problem, technicians use meters and electronic devices to check suspected circuits. For example, they check voltages until an unusual or irregular measure shows up the part of the circuitry causing trouble. When they find the problem, they make the necessary repairs or adjustments, using soldering irons, wire cutters, and other handtools. Technicians often use wiring diagrams and service manuals that show connections within organs, provide adjustment information, and describe causes of trouble. Because of the large differences among various brands of electronic organs, many technicians service only a particular brand.

Places of Employment

About 8,000 persons worked as full-time piano and organ tuners and repairers in 1974; most worked on pianos. About two-thirds of the total worked in independent repair shops; many were the sole operators of small shops. Another one-fifth were employed by piano and organ dealers. Most of the rest worked for piano and organ manufacturers.

Piano and organ tuners and repairers are employed mostly in big cities and in States that have large populations. In towns too small to offer enough work for a full-time job in this field, piano and pipe organ work may be done part time by local music teachers and professional musicians. Similarly, electronic organ work may be done by television and radio repairers.

Training, Other Qualifications, and Advancement

Piano and organ tuners and repairers generally learn on the job. Dealers and repair shops hire beginners to do general clean-up work, help move and install instruments, and do other routine tasks. Helpers

Piano tuners need manual dexterity and good hearing.

gradually learn to tune and to make simple repairs, and then take on more difficult jobs as they gain experience. Generally, 3 to 4 years of on-the-job training are needed to qualify as a piano, pipe organ, or electronic organ technician, although workers who have formal education in these fields can qualify in less time. Piano tuning alone usually can be learned on the job in less than 2 years.

Piano and organ manufacturers train inexperienced workers to assemble instruments. However, because assembly is done in many steps, workers learn little about the instrument as a whole, and need additional training in tuning and repair work before they can qualify as technicians.

People interested in a career in piano or organ servicing should have good hearing, mechanical aptitude, and manual dexterity. Because service work frequently is done in the customer's home, a neat appearance and a pleasant, cooperative manner also are important. Although some very capable piano technicians are blind, organ technicians need normal eyesight. Ability to play the instrument helps, but is not essential as a qualification.

In terms of education, employers prefer high school graduates. Music courses help develop the student's ear for tonal quality. Courses in woodworking are useful also because many of the moving parts in pianos and pipe organs are made of wood. For jobs as electronic organ technician trainees, applicants usually need formal training in electronics available from technical schools, junior and community colleges, and some technical-vocational high schools. Training in electronics also is available in the Armed Forces.

Courses in piano technology, which may take up to 2 years, are offered by a small number of technical schools. Some have special courses for the blind. Home study (correspondence school) courses in piano and organ technology also are available.

Piano and organ tuners and repairers keep up with new developments in their fields by studying trade magazines and manufacturers' service manuals. Most electronic organ manufacturers and the Piano Technicians's Guild conduct brief courses periodically to provide information on technical changes in their instruments.

Tuners and repairers who work for large dealers or repair shops can advance to supervisory positions. Most people in this field move up, however, by going into business for themselves. Relatively little capital is required beyond an initial investment in tools. Basic piano or pipe organ tools cost only a few hundred dollars. By contrast, tools and test equipment for electronic organs may cost a thousand dollars or more. Typically, self-employed tuners and repairers operate out of their own homes and use either a car or a small truck for service calls.

Employment Outlook

Little change in the employment of piano tuners, piano technicians, and pipe organ technicians is expected through the mid-1980's. Growth in the number of pianos and organs will be limited by competition from other forms of entertainment and recreation. Nevertheless, some jobs will open each year as experienced workers retire, die, or transfer to other occupations. Nearly all openings will be for piano tuners and technicians.

A moderate increase in jobs for electronic organ technicians is expected. The electronic organ, a comparatively new instrument, continues to grow in popularity. However, this is a very small occupation and the number of job openings will be far fewer than those for piano tuners and technicians.

Opportunities for beginners will be best in piano and organ dealerships and large repair shops. Many repair shops are too small to afford a full-time helper, although they may hire one helper part time.

Earnings and Working Conditions

Experienced workers earned from $3 to $8 an hour in 1974, depending on their level of skill and where they worked, according to limited information. Beginning rates for helpers ranged from $2.25 to $2.65 an hour.

Many self-employed tuners and repairers earned more than $10,000 a year, and earnings in excess of $15,000 a year were not uncommon. Earnings of the self-employed depend on the size of the community, their ability to attract and keep customers, their operating expenses, and competition from other tuners and repairers.

Service business increases with cold weather because at that time people spend more time indoors playing the piano or organ. Consequently, during fall and winter, many tuners and repairers work more than 40 hours a week. As business falls off during spring and summer, shops may take up the slack by reconditioning or rebuilding old instruments. Self-employed tuners and repairers frequently work evenings and weekends to suit their customers.

The work is relatively safe, although tuners and repairers may suffer small cuts and bruises when making repairs. Electrical shock is a minor hazard for electronic organ technicians but it has rarely caused serious injury. Work is performed in shops and homes and public buildings such as churches and schools where working conditions usually are pleasant.

Sources of Additional Information

Details about job opportunities

may be available from local piano and organ dealers and repair shops. For general information about piano technicians and a list of schools offering courses in piano technology, write to:

Piano Technicians Guild, Inc., P.O. Box 1813, Seattle, Wash. 98111.

SHOE REPAIRERS

(D.O.T. 365.381)

Nature of the Work

Shoe repairers spend most of their time replacing worn soles and heels. They remove worn soles and old stitching, and rough the bottom of the shoes on sanding wheels. They select new soles or cut them from pieces of leather; they then cement, nail, or sew the soles to the shoes. Finally, they trim the soles. To reheel shoes, repairers pry off old heels, select replacement heels or cut them to shape, and cement and nail them into place. After the heels and soles have been replaced, repairers stain and buff them to match the color of the shoes. Before completing the job, they may replace insoles, restitch loose seams, and polish the shoes. Highly skilled repairers may design, make, or repair orthopedic shoes according to doctors' prescriptions. Repairers also may mend handbags, luggage, tents, and other items made of leather, rubber, or canvas. They also replace zippers, dye shoes and handbags and fit boots to conform to the leg.

In large shops, repair work often is divided into a number of specialized tasks. For example, some repairers only remove and replace heels and soles; others only restitch torn seams.

Shoe repairers use power operated sole-stitchers and heel-nailing machines, and manually operated sewing machines. Among the handtools they use are hammers, awls, and nippers.

Self-employed shoe repairers have managerial responsibilities in addition to their regular duties. They estimate repair costs, keep records, and supervise other repairers.

Places of Employment

About 30,000 shoe repairers were employed in 1974. About one-half of them own shoe repair shops, many of which are small, one person operations. Most of the remaining repairers worked in large shoe shops. Some repairers worked in department stores, variety stores, shoe stores, and drycleaning shops.

All cities and towns and many very small communities have shoe repair shops. Employment, however, is concentrated in large cities.

Training, Other Qualifications, and Advancement

Most shoe repairers are hired as helpers and trained on the job. Helpers begin by assisting experienced repairers with simple tasks, such as staining, brushing, and shining shoes; then they progress to more difficult tasks, such as replacing heels, as they gain experience. Helpers who have aptitude and initiative usually become fully skilled after 2 years of on-the-job training.

Some repairers learn their trade at vocational schools. A small number enter the occupation through apprenticeship training programs.

Advancement opportunities are good. Many shoe repairers open their own shops. Some repairers become managers or supervisors in large shops.

Employment Outlook

The demand for shoe repairers is not expected to change significantly through the mid-1980's. As incomes rise, many people will buy new shoes rather than have old ones fixed. Cushioned-soled shoes and other casual foot-wear which usually are not practical to repair may also limit the demand for these workers.

Nevertheless, hundreds of job openings are expected each year because of the need to replace experienced shoe repairers who retire, die, or leave the field for other reasons. Replacement needs are relatively high because shoe repairers are, on the average, older than workers in other occupations.

Beginners will find most opportunities in metropolitan areas. Jobs may be scarce in small communities because many of the shoe shops are operated solely by owners and do not need employees.

Since about one-half of all shoe repairers are self-employed and a large proportion of them are approaching retirement, opportunities should be very good for experienced repairers who wish to open their own shops.

In recent years, employment of shoe repairers has declined, largely because the number of young people entering the trade have not been great enough to replace the experienced repairers who have retired or stopped working for other reasons. Factors contributing to this are the unglamorous nature of the work and the relatively low starting pay for trainees. Also, young job seekers probably overlook some merits of the trade: Few trades offer better opportunities for self-employment; earnings of self-employed shoe repairers compare favorably with those of workers in many other skilled occupations; and the work is steady because the shoe repair business is not very sensitive to changes in economic conditions.

Earnings and Working Conditions

Information from a limited number of employers indicate that many shoe repairers earned between $2.90 and $4 an hour in 1974. Inexperienced trainees generally earned between $2 and $2.50 an hour. Some highly skilled repairers, including managers of shoe repair shops, earned more than $300 a week.

Shoe repairers generally work 8 hours a day, 5 days a week. The workweek for the self-employed is often longer, sometimes 10 hours a day, 6 days a week. Although shoe repair shops are busiest during the spring and fall, work is steady with no seasonal layoffs.

Working conditions generally are good in large repair shops, but small shops may be crowded and noisy and have poor light or ventilation. Strong odors from leather goods, dyes, and stains may be present.

The work is not strenuous, but it does require stamina, because repairers must stand much of the time.

Sources of Additional Information

Information about work opportunities may be available from the local office of the State employment service, as well as shoe shops in the community.

TELEVISION AND RADIO SERVICE TECHNICIANS

(D.O.T. 720.281)

Nature of the Work

Television and radio service technicians repair a large and growing number of electronic products, of which television sets and radios are by far the most numerous. They also repair stereo components, tape recorders, intercoms, and public address systems. Some service technicians specialize in repairing one kind of equipment—for example, television sets or car radios.

Equipment may operate unsatisfactorily or break down completely because of faulty tubes or transistors, poor connections, or other problems. Service technicians check and evaluate each possible cause of trouble; they begin by checking for the most common cause—tube or module failure. In other routine checks, they look for loose or broken connections and for parts that are charred or burned.

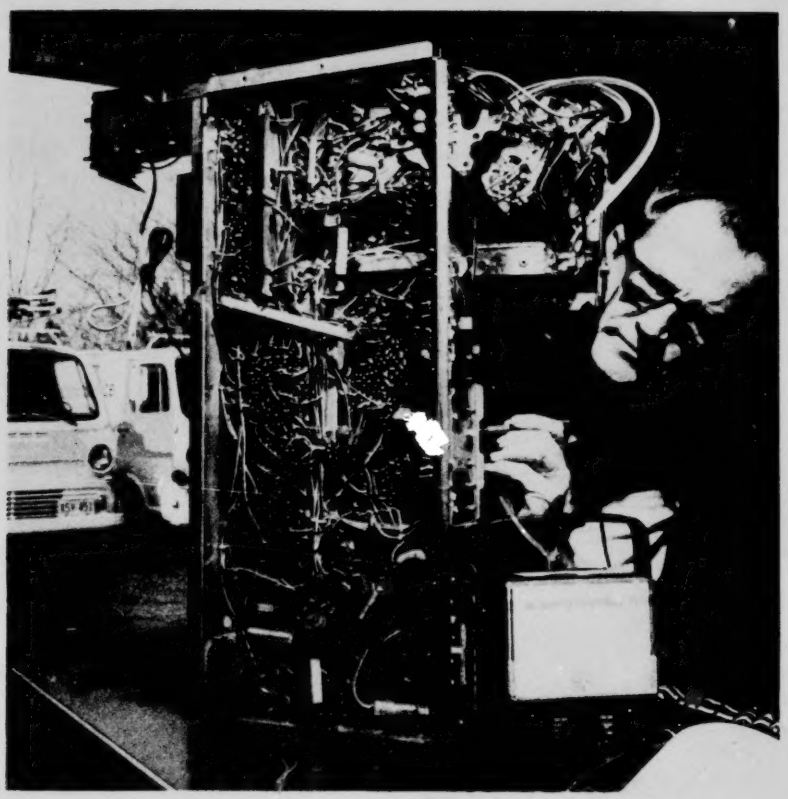
When routine checks do not locate the trouble, technicians use test equipment, such as voltmeters, oscilloscopes, and signal generators, to check suspected circuits. For example, they may measure voltages or wave forms in a television set until an unusual or irregular measurement indicates the faulty part. Once the cause of trouble is found, they replace faulty parts and make adjustments, such as focusing and converging the picture or correcting the color balance.

Technicians who make customer service calls carry tubes, modules, and other parts that can be easily replaced in the customer's home. Radios, portable televisions, and other small equipment usually are repaired in service shops. Large television sets also are repaired in shops when the trouble must be located with complex test equipment.

Service technicians use screwdrivers, pliers, wire cutters, soldering irons, and other handtools. They refer to wiring diagrams and service manuals that show connections and provide information on how to locate problems and make repairs.

Places of Employment

About 135,000 people worked as radio and television service technicians in 1974. About one-third of



Television mechanics use instruments to locate faulty circuits.

them were self-employed, a much larger proportion than in most skilled trades.

Two-thirds of all service technicians, either self-employed or working for others, worked in shops and stores that sell and service television sets, radios, and other electronic products. Most of the rest were employed by manufacturers of such products.

Television and radio service technicians work in almost every city. Geographically, employment is distributed in much the same way as the Nation's population.

Training, Other Qualifications, and Advancement

Training and experience in electronics are required in order to become a skilled television and radio service technician. Technical, vocational, or high school training in electronics, mathematics, blueprint reading, and physics may provide a good background for entering the field. The military service offers training and work experience that is very useful to civilian electronics work. Correspondence school courses also are helpful.

Up to 2 years of technical training in electronics plus 2 to 4 years of on-the-job experience usually are required to become a fully qualified service technician. People who have no previous technical training may be hired as helpers or apprentices if they show aptitude for the work or, like the amateur "ham" radio operator, have a hobby in electronics. An apprenticeship program lasts about 4 years and may include home study.

An important part of the service technician's training is provided by many manufacturers, employers, and trade associations. They conduct training programs to keep service technicians abreast of the latest servicing methods for new models or products. Technicians also keep up with technical developments by studying manufacturers' instruction manuals and technical magazines and by attending training seminars.

Television and radio service technicians must know how electronic components and circuits work. Other essential qualifications include the ability to manipulate small parts and tools, good eye-hand coordination, normal hearing, good eyesight and color vision, and an ability to work with people.

Service technicians who work in large repair shops may be promoted to supervisor or service manager. Technicians who have sufficient funds may open their own sales and repair shops. Some technicians obtain jobs as electronic "trouble shooters" or technicians in manufacturing industries or government agencies. A small number of highly qualified technicians who are employed by manufacturers can advance to higher paying occupations, such as technical writer, sales engineer, design engineer, or service training instructor.

People interested in advancing to positions such as electronic technician can improve their opportunities by taking trade school, correspondence, or technical institute courses in automatic controls, electronic engineering, television engineering, and mathematics. Those planning to go into business for themselves should take some business administration courses, particularly accounting.

A growing number of States require radio and television technicians to be licensed. To obtain a license, applicants must pass an examination designed to test their knowledge of electronic circuits

and components and their skill in the use of testing equipment.

Employment Outlook

Employment of television and radio service technicians is expected to increase faster than the average for all occupations through the mid-1980's. In addition to openings from employment growth, many openings will result each year from the need to replace experienced technicians who retire, die, or change occupations.

Employment of service technicians is expected to increase in response to the growing number of radios, television sets, phonographs, tape recorders, and other home entertainment products in use. Rising population and personal incomes will contribute to this growth. Over 95 percent of all households have at least one television set, and the number of households with two sets or more is expected to increase significantly, mainly because of the growing demand for color and portable sets. Greater use of electronic products for purposes other than entertainment also is expected; for example, closed-circuit television, two-way radios, calculators, and various medical electronic devices. Closed-circuit television is being used increasingly to monitor production processes in manufacturing plants and to bring educational programs into classrooms.

People who enter the occupation should have steady work because the television and radio repair business is not very sensitive to changes in economic conditions.

Earnings and Working Conditions

Earnings of television and radio service technicians ranged from $3 to $7 an hour in 1974, based on the limited information available. The wide variations in wage rates reflect differences in skill level, type of employer, and geographic location.

Television and radio service technicians employed in local service shops or dealer service departments usually work 40 to 48 hours a week.

Service on television, radio, and other home entertainment products is performed in shops and homes, where working conditions are usually pleasant. Some physical strain is involved in lifting and carrying equipment. Hazards include electrical shock and the risk of falling from roofs while installing or repairing antennas.

Some service technicians are members of labor unions. Most of them belong to the International Brotherhood of Electrical Workers.

Sources of Additional Information

For more information about jobs in this field, contact local shops and stores that service television sets and radios and other electronic equipment. Technical and vocational schools that offer courses in television and radio repair or electronics may provide information about training. In addition, the local office of the State employment service may have information about programs that provide training opportunities.

Information about the work of television and radio service technicians is available from locals of the International Brotherhood of Electrical Workers and from:

National Alliance of Television and Electronic Service Associations, 5908 S. Troy St., Chicago, Ill. 60629.

Electronics Industries Association, 2001 Eye St. NW., Washington, D.C. 20006.

TRUCK MECHANICS AND BUS MECHANICS

(D.O.T. 620.281)

Nature of the Work

Mechanics are needed to keep the Nation's commercial vehicles in good operating condition. Truck mechanics maintain and repair heavy trucks used for mining, construction, and intercity travel; and small trucks used for local hauling. Bus mechanics service both local and transcontinental buses. Although many truck and bus parts are similar to automobile parts, complex transmissions, air-brakes, many components are quite different from those used in automobiles.

Mechanics employed by organizations that maintain their own vehicles may spend much time doing preventive maintenance to assure safe vehicle operation, prevent wear and damage to parts, and reduce costly breakdowns. During a maintenance check, mechanics may inspect brake systems, steering mechanisms, wheel bearings, and other parts, and make needed repairs and adjustments.

In large shops, mechanics may specialize in one or two kinds of repair. For example, some mechanics specialize in major engine or transmission work. If an engine is to be rebuilt the mechanic disassembles it, examines parts—such as valves or pistons—for wear, and replaces or repairs defective parts. Many mechanics specialize in diesel engines. Diesel and gasoline engines have different fuel and ignition systems. A mechanic who has worked only on gasoline engines needs special training to qualify as a diesel mechanic. (See statement on diesel mechanics elsewhere in the *Handbook*.)

Truck and bus mechanics use common handtools such as screwdrivers and pliers; power and machine tools such as pneumatic wrenches and drills; and welding and flame cutting equipment. They also use testing equipment, such as dynamometers to locate malfunctions, and jacks and hoists to lift and move large parts.

When doing heavy work, such as

removing engines and transmissions, two mechanics may work as a team, or a mechanic may be assisted by an apprentice or helper. Mechanics generally work under a shop supervisor or service manager.

Places of Employment

A large proportion of the estimated 135,000 truck mechanics employed in 1974 worked for firms that owned fleets of trucks. Fleet owners include trucking companies and businesses that haul their own products such as dairies and bakeries. Other employers include truck dealers, truck manufacturers, truck repair shops, firms that rent or lease trucks, and Federal, State, and local governments.

Most of the estimated 20,000 bus mechanics employed in 1974 worked for local transit companies and intercity buslines. Bus manufacturers employed a relatively small number of mechanics.

Truck and bus mechanics are employed in every section of the country, but most of them work in large towns and cities where trucking companies, buslines, and other fleet owners have large repair shops.

Training, Other Qualifications, and Advancement

Most truck or bus mechanics learn their skills on the job. Beginners usually do tasks such as cleaning, fueling, and lubrication. They may also drive vehicles in and out of the shop. As beginners gain experience and as vacancies become available, they usually are promoted to mechanics' helpers. In some shops, young persons—especially those having prior automobile repair experience—begin as mechanics' helpers.

Most helpers can make minor repairs after a few months experience, and advance to increasingly difficult jobs as they prove their ability. Generally, 3 to 4 years of on-the-job experience is necessary to qualify as an all-round truck or bus mechanic. Additional training may be necessary for mechanics who wish to specialize in diesel engines.

Most training authorities recommend a formal 4-year apprenticeship as the best way to learn these trades. Typical apprenticeship programs for truck and bus mechanics consist of approximately 8,000 hours of shop training and at least 576 hours of classroom instruction. Frequently, these programs include training in both diesel and gasoline engine repair.

For entry jobs, employers generally look for applicants who have mechanical aptitude, are at least 18 years of age, and in good physical condition. Completion of high school is an advantage in getting an entry mechanic job, because most employers believe it indicates that a young person can finish a job and has advancement potential.

When the mechanic's duties include driving trucks or buses on public roads, applicants may have to get a State chauffeur's license. If the employer is engaged in interstate transportation, applicants also may have to meet qualifications for drivers established by the U.S. Department of Transportation. These applicants must be at least 21 years of age, able bodied, and have good hearing, and 20/40 eyesight with or without glasses. They must read and speak English and have a good driving record, including 1 year's driving experience.

Young persons interested in becoming truck or bus mechanics

Bus mechanic repairs suspension system.

can gain valuable experience by taking high school or vocational school courses in automobile and diesel repair. Science and mathematics are helpful since they better one's understanding of how trucks and buses operate. Practical experience in automobile repair from working in a gasoline service station, training in the Armed Forces, and working on automobiles as a hobby also is valuable.

Most mechanics must buy their own handtools. Experienced mechanics often have several hundred dollars invested in tools.

Employers sometimes send experienced mechanics to special training classes conducted by truck, bus, diesel engine, and parts manufacturers. In these classes, mechanics learn to repair the latest equipment or receive special training in subjects such as diagnosing engine malfunctions. Mechanics also may read service and repair manuals to keep abreast of engineering changes.

Experienced mechanics who have leadership ability may advance to shop supervisors or service managers. Truck mechanics who have sales ability sometimes become truck sales representatives. Some mechanics open their own gasoline service stations or repair shops.

Employment Outlook

Employment of truck mechanics is expected to increase faster than the average for all occupations through the mid-1980's as a result of significant increases in the transportation of freight by trucks. More trucks will be needed for both local and intercity hauling due to increased industrial activity, continued decentralization of industry, and the continued growth of the suburbs. In addition to the jobs created by employment growth, many openings will arise to replace truck mechanics who retire, die, or transfer to other occupations.

Bus mechanic employment is expected to increase slower than the average for all occupations through the mid-1980's because of offsetting factors affecting the demand for bus service. More buses will be needed for local travel due to increased emphasis on mass transit systems. Intercity bus travel, on the other hand, is expected to remain about the same. Most job openings will result from the need to replace bus mechanics who retire, die, or transfer to other occupations.

Earnings and Working Conditions

According to a survey of metropolitan areas in 1973-74, mechanics employed by trucking companies, buslines, and other firms that maintain their own vehicles had average hourly earnings of $5.65. By comparison, nonsupervisory workers in private industry, except farming, averaged $4.05.

Beginning apprentices usually earn one-half the rate of skilled workers and get increases about every 6 months until a rate of 90 percent is reached.

Most mechanics work between 40 and 48 hours per week. Because many truck and bus firms provide service around the clock, mechanics who work for these firms may work evenings, night shifts, and weekends. When they do, they usually receive a higher rate of pay.

Truck mechanics and bus mechanics are subject to the usual shop hazards such as cuts and bruises. Mechanics handle greasy and dirty parts and may have to stand or lie in awkward or cramped positions when repairing vehicles. Work areas usually are well lighted, heated, and ventilated, and many employers provide locker rooms and shower facilities. Although most work is done indoors, mechanics occasionally have to work or make emergency repairs on the road.

Many truck and bus mechanics are members of labor unions, including the International Association of Machinists and Aerospace Workers; the Amalgamated Transit Union; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the Transport Workers Union of America; the Sheet Metal Workers' International Association; and the International Brotherhood of Teamsters, Chauffers, Warehousemen and Helpers of America (Ind.).

Sources of Additional Information

More details about work opportunities for truck or bus mechanics may be obtained from local employers such as trucking companies, truck dealers, or bus lines; locals of unions previously mentioned; or the local office of the State employment service. The State employment service also may have information about the apprenticeship and other programs that provide training opportunities.

For general information about the work of truck mechanics and apprenticeship training, write to:

American Trucking Associations, Inc., 1616 P St. NW., Washington, D.C. 20036.

VENDING MACHINE MECHANICS

(D.O.T. 639.381)

Nature of the Work

Vending machines have become a familiar scene in everyday life. In places of recreation, work, and education, vending machines provide everything from a piece of candy to a full-course meal.

Vending machine mechanics keep these machines in good working order. They also may assemble and install machines, and in some cases, stock them with merchan-

dise. Some mechanics work only in repair shops and some work only in the field, but many do both. Those who work in the field are assigned a service truck to travel between locations.

In preparing machines for installation, mechanics follow instructions supplied by the manufacturer. After the machine is put together and tested, the mechanic fills it with products or ingredients and gives it a test run. When working on complicated machines, such as beverage or food dispensers, mechanics check to see that the machines give proper quantities of ingredients and that refrigerating and heating units work properly. On gravity-operated machines, mechanics check springs, plungers, and merchandise delivery systems. They also test coin and change-making mechanisms. When installing machines on location, mechanics make the necessary water and electrical connections and recheck the machines for proper operation.

Preventive maintenance—avoiding trouble before it starts—is another major part of the job. For example, mechanics periodically clean electrical contact points, lubricate mechanical parts, and adjust machines to perform properly. When a machine breaks down, mechanics must determine the cause of the trouble. They first inspect the machine for obvious problems, such as loose electrical wires, malfunctions of the coin mechanism, and leaks. If the problem cannot be readily located, they may refer to troubleshooting manuals and wiring diagrams and use testing devices such as electrical circuit testers to find defective parts. Mechanics then repair or replace the faulty parts, either on location or in the employer's service shop.

Mechanics use pipe cutters, soldering irons, wrenches, screwdrivers, hammers, and other handtools. In the shop, they also may use power tools, such as grinding wheels, saws, and drills.

Mechanics who install and repair food vending machines must know State public health and sanitation standards as well as those established under local plumbing codes. They also must know and follow safety procedures, especially when lifting heavy objects and working with electricity and gas.

Mechanics must do some clerical work, such as filing reports, preparing repair cost estimates, and ordering parts. Those employed by small operating companies frequently service as well as repair machines. These combination "mechanic-routeworkers" stock machines, collect money, fill coin and currency changers, and keep daily records of merchandise distributed. (Additional information about vending machine route drivers is included in the statement on Route Drivers elsewhere in the *Handbook*.)

Vending machine mechanic uses test equipment to locate problem.

Places of Employment

In 1974, about 24,000 mechanics maintained and repaired more than 5 million vending machines. Most mechanics work for vending service companies that install machines and provide services, such as cleaning, stocking, and repairing. Other mechanics work for beverage companies that have coin-operated machines. Some also work for companies that own and operate juke boxes, pin-ball machines, and

laundry and drycleaning machines. Although mechanics are employed throughout the country, most are located in industrial and commercial centers where there are a large number of vending machines.

Vending machine manufacturers employ some highly skilled mechanics, often called technical representatives, to explain technical innovations and ways to repair new machines to other mechanics. Instruction takes place either in manufacturers' service divisions in major cities or in operators' repair shops.

Training, Other Qualifications, and Advancement

Persons usually enter this trade as general shop helpers or vending machine route drivers. If shop helpers or route drivers show promise as mechanics, they may become trainees. Some workers are hired directly as mechanic trainees.

Trainees learn the trade on the job—observing, working with, and receiving instruction from experienced mechanics. Sometimes, they attend manufacturer-sponsored training sessions, which emphasize the repair of new and complex machines. Employers usually pay wages and expenses during these sessions which may last from a few days to several weeks.

Because vending machines are becoming more complex, some employers encourage both trainees and experienced mechanics to take evening courses in subjects related to machine operation and repair—for example, basic electricity and refrigeration. Employers pay for at least part of the tuition and book expenses for these courses.

The length of on-the-job training varies with the individual's capabilities and previous education. Although it usually takes from 1 to 2 years for trainees to become skilled, they often can handle simple repair jobs after 6 months. Mechanics are generally "in training" throughout their working lives, since they must learn to install and repair new and improved vending equipment.

Many beginners are high school graduates, but employers generally do not require a diploma. High school or vocational school courses in electricity, refrigeration, and machine repair help beginners to qualify for entry jobs. These courses also may help beginners to skip the lowest rung of the job ladder—general shop helper.

Employers require applicants to demonstrate mechanical ability, either through their work experience or by scoring well on mechanical aptitude tests. Since mechanics are exposed to thousands of dollars in merchandise and cash, employers will hire only applicants who have a record of honesty and respect for the law. The ability to deal tactfully with people also is important. A commercial driver's license and a good driving record are essential for most vending machine repair jobs.

Skilled mechanics may be promoted to senior mechanic or, in large companies, to shop supervisor. Advancement to service manager, who schedules repair work, is possible for mechanics having administrative ability. Mechanics having initiative and adequate financial backing may become independent operators.

Employment Outlook

Employment of vending machine mechanics is expected to grow more slowly than the average for all occupations through the mid-1980's. Most job openings will arise as a result of the need to replace experienced mechanics who retire, die, or transfer to other occupations. Because this is a small occupation, however, the number of openings will be relatively small.

Vending machine business will increase as population grows and as more industrial plants, hospitals, stores and other establishments move to suburban areas where restaurants are not always close by. Growth in the number of vending machines will create more jobs for mechanics.

Earnings and Working Conditions

Wage rates for vending machine mechanics ranged from $4.15 to $5.76 an hour in 1974, based on information from a small number of union contracts.

Most vending machine mechanics work 8 hours a day, 5 days a week, and receive premium pay for overtime. Since vending machines can be operated around the clock, mechanics frequently work at night and on weekends and holidays. Some union contracts stipulate higher pay for nightwork and for emergency repair jobs on weekends and holidays.

Vending machine repair shops are generally quiet, well-lighted, and have adequate workspace However, when servicing machines on location, mechanics may work in cramped quarters, such as passageways, where pedestrian traffic is heavy. Repair work is relatively safe, although mechanics are subject to shop hazards such as electrical shocks and cuts from sharp tools and metal objects.

Many vending machine mechanics employed by large companies are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen, and Helpers of America.

Sources of Additional Information

Further information on job opportunities can be obtained from local vending machine operators and local offices of the State employment service. For general information on vending machine mechanics, write to the National

National Automatic Merchandising Association, 7 S. Dearborn St., Chicago, Ill. 60603.

WATCH REPAIRERS

(D.O.T. 715.281)

Nature of the Work

Watch repairers (also called watchmakers) clean, repair, and adjust watches, clocks, and other timepieces. When a watch is not working properly, repairers use tweezers, screwdrivers, and other tools to remove the watch from its case and disassemble the movement. With the aid of a special magnifying glass called a loupe, they carefully examine each part of the mechanism.

Repairers may replace the mainspring and other parts of the winding mechanism, adjust improperly fitted wheels, and replace broken hands or a cracked watch crystal. They clean and oil parts before reassembling the watch and testing it for accuracy.

In addition to handtools, watch repairers use timing and cleaning machines. They use electrical meters when repairing electronic watches to make sure that circuits work properly.

Watch repairers often own jewelry stores, and may do minor jewelry repair and sell watches, jewelry, silverware, and other items. They also may hire and supervise salesclerks, other watch repairers, and jewelers; arrange window displays; purchase goods to be sold; and perform other managerial duties.

Places of Employment

About 17,000 persons worked as watch repairers in 1974. One-third were self-employed. Most of the remainder worked for jewelry stores. Others worked for repair shops or for factories that made watches, clocks, or other precision timing instruments.

Watch repairer uses eye loupe to examine watch movement.

Although jewelry stores and repair shops are found in many small towns, most are in large commercial centers. Only a small amount of watch manufacturing is done in this country, mostly in Connecticut and New York.

Training, Other Qualifications, and Advancement

Most people learn the trade in watch repair schools; others learn on the job or through formal apprenticeship.

There generally are no specific educational requirements for entrance into any of the approximately 40 watch repair schools although most students are high school graduates. Courses usually last from 18 months to 24 months for full-time students. Students learn to take apart and reassemble various kinds of watch and clock movements, diagnose problems, make and adjust individual parts, and use and care for tools and machines. Some schools offer courses on repairing unusual types of timepieces, such as chronographs and timers. Most schools require students to furnish their own handtools.

The following States require watch repairers to obtain a license: Florida, Indiana, Iowa, Kentucky, Louisiana, Michigan, Minnesota, North Carolina, North Dakota, Oregon, and Wisconsin. To obtain a license, repairers must pass an examination designed to test their skill with tools and their knowledge of watch construction and repair.

Watch repairers in all States, however, can demonstrate their degree of competence by passing certification examinations given by the American Watchmakers Institute. Successful examinees receive the title of either Certified Watchmaker or Certified Master Watchmaker, depending on their proficiency. Annual voluntary examinations covering new phases of watchmaking also are offered, and those who pass are given a plaque of recognition.

A person planning a career as a watch repairer must be willing to sit for long periods and work with a minimum of supervision. The precise and delicate nature of the work requires patience and concentration. Good visual depth perception and eye-hand coordination helps in working with tiny parts.

Beginners who have sufficient funds may open their own watch repair shops, but the usual practice is to work for an experienced watch repairer before starting one's own business. Watch repairers may also open their own jewelry stores; however, these stores require a much greater financial investment than do repair shops.

Employment Outlook

Employment of watch repairers is expected to grow at a slower rate than the average for all occupations through the mid-1980's. Although more watches will be sold as population and incomes rise, many will be pin-lever types which cost little more to replace than repair. Consequently employment is not expected to keep pace with growth in the number of watches. Most job openings will result from the need

to replace experienced repairers who retire, die, or transfer to other occupations.

In recent years, replacement needs have been greater than the number of graduates from watch repair schools. If this gap continues, graduates should find jobs readily available. Opportunities are expected to be particularly good for graduates who have had courses in repairing electronic watches because these watches are growing in popularity.

Earnings and Working Conditions

Earnings of watch repairers in entry jobs generally ranged from about $125 to $165 for a 40-hour week in 1974, based on the limited information available. Experienced watch repairers working in retail stores, repair shops, and watch factories received from $200 to $250 for a 40-hour week. In addition, those in retail stores may receive commissions based on sales of watches and other items in the store. Watch repairers who own their own businesses usually earn considerably more than those working for a salary.

Watch repairers sometimes work longer than the standard 40-hour week. Those who are self-employed or located in small communities often work a 48-hour week or longer. The work involves little physical exertion, however, and generally is performed in comfortable surroundings. This light benchwork frequently is recommended to certain handicapped workers.

Some watch repairers are members of the International Jewelry Workers Union or the American Watch Workers Union (Ind.).

Sources of Additional Information

For information about training courses and watch repairing as a career contact:

American Watchmakers Institute, P.O. Box 11011, Cincinnati, Ohio 45211.

For information about job opportunities in retail stores contact:

Retail Jewelers of America, Inc., 10 Rooney Circle, West Orange, N.J. 07052.

Further information about work opportunities or training in this trade also is available from local offices of the State employment service.

HEALTH OCCUPATIONS

When people are sick or injured, having health services readily available becomes very important to them. The availability of these services depends, not only on the number of people employed in health occupations, but also on their geographic distribution. Numbers employed have grown very rapidly in recent years. How to improve their distribution remains a problem which is being attacked on the national, State, and local levels.

About 3.9 million people worked in health-related occupations in 1974. Besides doctors, nurses, dentists, and therapists, these include the behind-the-scenes technologists, technicians, administrators, and assistants.

Registered nurses, physicians, pharmacists, and dentists constitute the largest professional health occupations. In 1974 employment in these occupations ranged from 105,000 for dentists to 855,000 for registered nurses. Professional health occupations also include other medical practitioners—osteopathic physicians, chiropractors, optometrists, podiatrists, and veterinarians. Therapists (physical therapists, occupational therapists, and speech pathologists and audiologists) and administrators (health services administrators and medical record administrators) also are professional health workers, as are dietitians.

Other health service workers include technicians of various types, such as medical technologist, medical X-ray technician, dental hygienist, and dental laboratory technician. Large numbers—1.5 million—worked as practical nurses and auxiliary workers, including nursing aides, orderlies, hospital attendants, and psychiatric assistants.

Hospitals employ about half of all workers in the health field. Others work in clinics, laboratories, pharmacies, nursing homes, public health agencies, mental health centers, private offices, and patients' homes. Health workers are concentrated in the more heavily populated and prosperous areas of the Nation.

Training

The educational and other requirements for work in the health field are as diverse as the health occupations themselves. For example, professional health workers—physicians, dentists, pharmacists, and others —must complete a number of years of preprofessional and professional college education and pass a State licensing examination. On the other hand, some health service occupations can be entered with little specialized training. Many community and junior colleges offer courses to prepare students for various health occupations. In most of the occupations for which on-the-job training has been the usual means of preparation, employers now prefer persons who have completed one of these formal programs.

Earnings

Earnings of health workers range from the highest paid occupation—physicians—to that of hospital attendants, whose earnings are three-fourths of the average for all nonsupervisory workers in private industry, except farming. Earnings for the other health occupations that can be entered with up to 2 years of formal training are about the same as the average. People in health occupations that require graduation from college earn from one-and-a-quarter times to twice these average earnings. Among the occupations for which average yearly earnings are reported in the *Handbook*, the top 15 include 8 of the professional health occupations, including all 6 medical practitioners.

Outlook

Overall employment in the health field is expected to grow much faster than the average for all occupations through the mid-1980's, although the rates of growth will differ considerably among individual health occupations. Among the factors that are expected to contribute to an increase in the demand for health care are population growth and the public's increasing health consciousness. Expansion of coverage under prepayment programs that make it easier for persons to pay for hospitalization and medical care also will contribute to growth in this field. Other openings will be created each year by the increasing expenditures by Federal, State, and local governments for health care and services.

In addition to jobs created by employment growth, many new workers will be needed each year to replace those who retire, die, or leave the field for other reasons.

Recent expansion of training programs in most of the occupations will add to the supply of trained health service personnel. The employment outlook in the various occupations ranges from excellent to competitive, depending on the balance between supply of workers and expected openings. See the individual statements for the outlook for each occupation.

DENTAL OCCUPATIONS

Proper dental care is an integral part of overall health care. This section focuses on the dental profession and the three key dental occupations.

Dentists examine and treat patients for oral diseases and abnormalities, such as decayed and impacted teeth. To an increasing extent, however, modern dentistry is emphasizing education in the proper care of teeth and gums to prevent future dental problems before they occur.

Dental hygienists are the only dental auxiliary workers required by each State to be licensed. They scale, clean, and polish teeth, expose X-rays, and instruct patients in proper oral hygiene.

Dental assistants prepare patients for treatment and assist dentists while they are working with patients. They work primarily in private offices.

Dental laboratory technicians prepare various dental and orthodontal appliances from models and specifications received from dentists. This work requires patience, minute attention to detail, and a high degree of manual dexterity.

DENTISTS

(D.O.T. 072.108)

Nature of the Work

Dentists examine teeth and other tissues of the mouth to diagnose diseases or abnormalities. They take X-rays, fill cavities, straighten teeth, and treat gum diseases. Dentists extract teeth and substitute artificial dentures designed for the individual patient. They also perform corrective surgery of the gums and supporting bones. In addition, they may clean teeth.

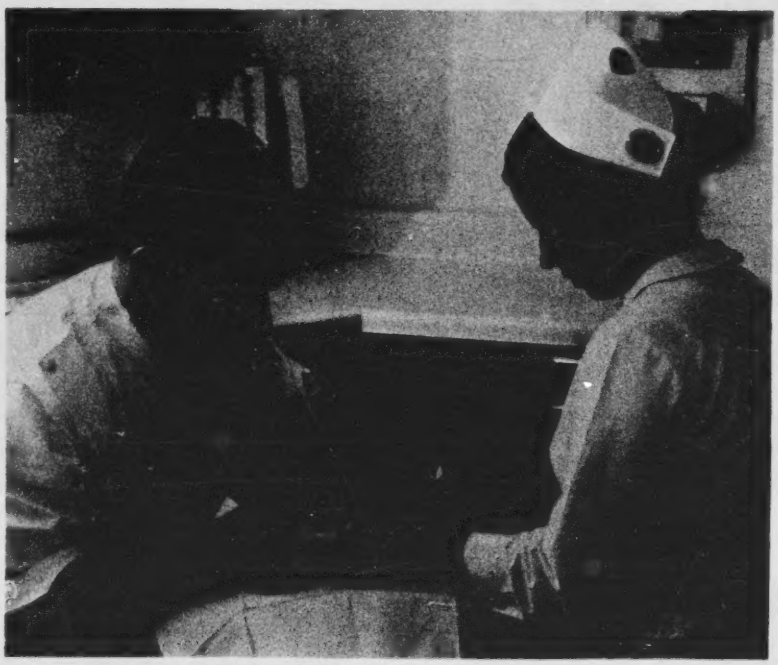
Dentists spend most of their time with patients, but may devote some time to laboratory work such as making dentures and inlays. Most dentists, however—particularly in large cities—send their laboratory work to commercial firms. Some dentists also employ dental hygienists to clean patients' teeth and provide instruction for patient self-care. (See statement on Dental Hygienists.) They also may employ other assistants who perform office work, assist in "chairside" duties, and provide therapeutic services under the supervision of the dentist.

Most dentists are general practitioners who provide many types of dental care; about 10 percent are specialists. The largest group of specialists are orthodontists, who straighten teeth. The next largest group, oral surgeons, operate on the mouth and jaws. The remainder specialize in pedodontics (dentistry for children); periodontics (treating the gums); prosthodontics (making artificial teeth or dentures); endodontics (root canal therapy); public health dentistry; and oral pathology (diseases of the mouth).

About 4 percent of all dentists teach in dental schools, do research, or administer dental health programs on a full-time basis. Many dentists in private practice do this work on a part-time basis.

Places of Employment

Over 105,000 dentists were at work in the United States in 1974—



9 of every 10 were in private practice. About 6,500 served as commissioned officers in the Armed Forces, and about 1,100 had other types of Federal Government positions—chiefly in the hospitals and clinics of the Veterans Administration and the Public Health Service. Women dentists represent only about 2 percent of the profession, but their number is increasing.

Training, Other Qualifications, and Advancement

A license to practice dentistry is required in all States and the District of Columbia. To qualify for a license, a candidate must be a graduate of an approved dental school and pass a State board examination. In 1974, 49 States and the District of Columbia recognized the examination given by the National Board of Dental Examiners as a substitute for the written part of the State board examinations. Delaware also requires new graduates to serve 1 year of hospital internship, in addition to passing the written examination. Most State licenses permit dentists to engage in both general and specialized practice. In 13 States, however, a dentist cannot be licensed as a "specialist" without 2 or 3 years of graduate education and passing a special State examination. Few States permit dentists licensed in other States to practice in their jurisdictions without further examination.

Dental colleges require from 2 to 4 years of predental education. However, of those students entering dental school in 1974, 76 percent had a baccalaureate or master's degree. Predental education must include courses in the sciences and humanities.

Competition is keen for admission to dental schools. In selecting students, schools give considerable weight to college grades and amount of college education. In addition, all dental schools participate in a nationwide admission testing program, and scores earned on these tests are considered along with information gathered about the applicant through recommendations and interviews. Many State-supported dental schools also give preference to residents of their particular States.

Dental school training generally lasts 4 academic years although some institutions condense this into 3 calendar years. Studies begin with an emphasis on classroom instruction and laboratory work in basic sciences such as anatomy, microbiology, biochemistry, and physiology. Courses in clinical sciences and preclinical technique also are provided at this time. The last 2 years are spent chiefly in a dental clinic, treating patients.

The degree of Doctor of Dental Surgery (D.D.S.) is awarded by most dental colleges. An equivalent degree, Doctor of Dental Medicine (D.M.D.), is conferred by 18 schools.

Dentists who want to do research, teach, or become specialists must spend an additional 2 to 4 years in advanced dental training in programs operated by dental schools, hospitals, and other institutions of higher education.

Dental education is very costly because of the length of time required to earn the dental degree. However, Federal funds provide a limited number of loans for dental students, and scholarships are available for qualifying students who agree to a minimum of 2 years' Federal service.

The profession of dentistry requires both manual skills and a high level of intelligence. Dentists should have good visual memory, excellent judgment of space and shape, delicacy of touch, and a high degree of manual dexterity, as well as scientific ability. Good business sense, self-discipline, and the ability to instill confidence are helpful for success in private practice. High school students who want to become dentists are advised to take courses in biology, chemistry, health, and mathematics.

Most dental graduates open their own offices or purchase established practices. Some start in practice with established dentists, to gain experience and to save the money required to equip an office; others may enter residency or internship training programs in approved hospitals. Dentists who enter the Armed Forces are commissioned as captain in the Army and Air Force and as lieutenants in the Navy. Graduates of recognized dental schools are eligible for Federal Civil Service positions and for commissions (equivalent to lieutenants in the Navy) in the U.S. Public Health Service.

Employment Outlook

Employment opportunities for dentists are expected to be excellent through the mid-1980's. Dental school enrollments have grown in recent years because of federally assisted construction of additional training facilities. However, unless schools expand beyond present levels, the number of new entrants to the field is expected to fall short of the number needed to fill openings created by growth of the occupation and by those who die or retire from the profession.

Employment of dentists is expected to grow faster than the average for all occupations due to population growth, increased awareness that regular dental care helps prevent and control dental diseases, and the expansion of prepayment arrangements which make it easier for people to afford dental services. In addition, dental public health programs will need qualified administrators and dental colleges will need additional faculty members. Many dentists will continue to serve in the Armed Forces.

Fluoridation of community water supplies and improved dental hygiene may prevent some tooth and

gum disorders, and preserve teeth that might otherwise be extracted. However, since the preserved teeth will need care in the future, these measures may increase rather than decrease the demand for dental care. New techniques, equipment, and drugs, as well as the expanded use of dental hygienists, assistants, and laboratory technicians should enable individual dentists to care for more patients. However, these developments are not expected to offset the need for more dentists.

Earnings and Working Conditions

During the first year or two of practice, dentists often earn little more than the minimum needed to cover expenses, but their earnings usually rise rapidly as their practice develops. Specialists generally earn considerably more than general practitioners. The average income of dentists in 1974 was about $38,000 a year, according to the limited information available. In the Federal Government, new graduates of dental schools could expect to start at $15,481 a year in late 1974.

Location is one of the major factors affecting the income of dentists who open their own offices. For example, in high-income urban areas, dental services are in great demand; however, a practice can be developed most quickly in small towns, where new dentists easily become known and where they may face less competition from established practitioners. Although the income from practice in small towns may rise rapidly at first, over the long run the level of earnings, like the cost of living, may be lower than it is in larger communities.

Most dental offices are open 5 days a week and some dentists have evening hours. Dentists usually work between 40 and 45 hours a week, although many spend more than 50 hours a week in the office. Dentists often work fewer hours as they grow older, and a considerable number continue in part-time practice well beyond the usual retirement age.

Sources of Additional Information

Persons who wish to practice in a given State should obtain the requirements for licensure from the board of dental examiners of that State. Lists of State boards and of accredited dental schools, as well as information on dentistry as a career, is available from:

American Dental Association, Council on Dental Education, 211 East Chicago Ave., Chicago, Ill. 60611.

American Association of Dental Schools, 1625 Massachusetts Ave. NW., Washington, D.C. 20036.

Students should contact the director of student financial aid at the school they attend to get information about Federal loans and scholarships.

DENTAL ASSISTANTS

(D.O.T. 079.378)

Nature of the Work

Dental assistants work with dentists as they examine and treat patients. The assistant makes the patients comfortable in the dental chair, prepares them for treatment, and obtains their dental records. The assistant hands the dentist the proper instruments and materials and keeps the patient's mouth clear by using suction or other devices. Dental assistants prepare materials for making impressions and restorations and expose X-rays and process dental X-ray film as directed by the dentist. They also provide oral health instruction and prepare instruments for sterilization.

Dental assistants perform a variety of duties that do not require the dentist's professional knowledge and skill. Some assistants make casts of the teeth and mouth from impressions taken by the dentist. These casts are used by dentists and technicians to make dentures. Some assistants apply medicine to the teeth and oral tissue, remove excess cement used in the filling process from surfaces of the teeth, and place rubber dams on the teeth to isolate them for individual treatment. Some dental assistants manage the office and arrange and confirm appointments, receive patients, keep treatment records, send bills, receive payments, and order dental supplies and materials.

The work of the dental assistant should not be confused with that of the dental hygienist who scales and cleans the teeth. (See statement on Dental Hygienists elsewhere in the *Handbook*.)

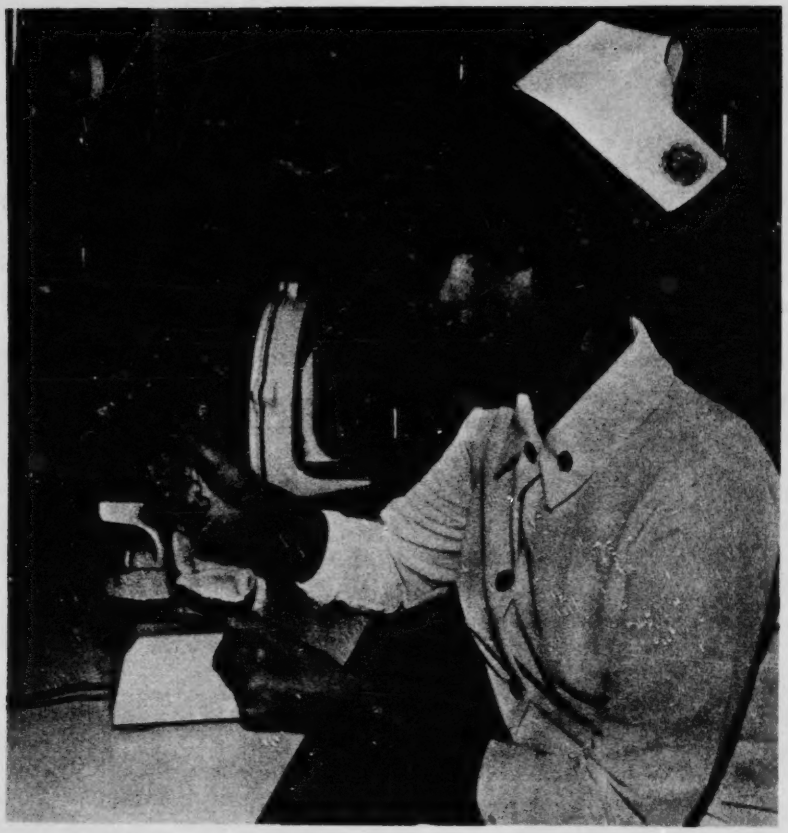
Places of Employment

Nearly 120,000 persons, practically all of them women, worked as dental assistants in 1974; about 1 out of 10 worked part time.

Most dental assistants work in private dental offices, either for individual dentists or for groups of dentists. Many of the remainder work in dental schools, hospital dental departments, State and local public health departments, or private clinics. The Federal Government employs dental assistants, chiefly in the Public Health Service, the Veterans Administration, and the Armed Forces.

Training, Other Qualifications, and Advancement

Most dental assistants learn their skills on the job. An increasing number, however, are trained in formal post-high school programs. About 260 such programs were accredited by the Council on Dental Education of the American Dental Association (ADA) in 1974. Some



Dental assistants prepare materials for making impressions.

were supported by funds authorized under Federal legislation.

Most post-high school courses in dental assisting are given in junior and community colleges or in vocational or technical schools. More than three-fourths of these programs last 1 year and lead to a certificate or diploma. Graduates of 2-year programs offered in junior and community colleges earn an associate degree upon completion of specialized training and liberal arts courses. The minimum requirement for any of these programs is a high school diploma or its equivalent. Some schools also require typing or a science or business course. Although some private schools offer 4- to 6-month courses in dental assisting, these are not accredited by the dental profession.

High school students interested in careers as dental assistants are advised to take courses in biology, chemistry, health, typing, and office practice.

Approved dental assisting curriculums include classroom and laboratory instruction in skills and related theory and usually a general occupational orientation. Trainees get practical experience in affiliated dental schools, local clinics, or selected dental offices.

A correspondence course accredited by the American Dental Association is available for employed dental assistants who are learning on the job or who otherwise are unable to participate in regular dental assisting programs on a full-time basis. The correspondence program is equivalent to 1 academic year of study, but generally requires about 2 years to complete.

Graduates of accredited dental assistant programs who successfully complete an examination administered by the Certifying Board of the American Dental Assistants Association may become Certified Dental Assistants. Certification is acknowledgement of an assistant's qualifications but is not generally required for employment.

After working 1 or 2 years, dental assistants sometimes seek to add to their skills by becoming dental hygienists. Prospective dental assistants who foresee this possibility should plan carefully since credit earned in a dental assistant program usually is not applicable toward requirements for a dental hygiene certificate.

Employment Outlook

Employment opportunities for dental assistants are expected to be excellent through the mid-1980's, especially for graduates of academic programs in dental assisting. Part-time opportunities also will be very favorable.

Employment of dental assistants is expected to grow faster than the average for all occupations, largely because recent graduates of dental schools have been taught to use assistants in their practice. In addition, the increase in the demand for dental services which stems from population growth, a growing awareness of the importance of regular dental care, and the increasing ability of people to pay for care will contribute to the demand for dental assistants. For example, increased participation in dental prepayment plans and public programs such as Medicaid bring dental services within the reach of many who could not afford them otherwise.

In addition to job openings created by growth in the demand for dental assistants, thousands of assistants also will be required each year to replace those who leave the field.

Earnings and Working Conditions

Salary depends largely on the assistant's education and experience, the duties and responsibilities attached to the particular job, and geographic location. Most dental assistants earned annual salaries between $5,200 and $7,800 in 1974, according to the limited data available.

In the Federal Government, experience and the amount and type of education determine entrance salaries. In late 1974, a high school graduate who had 6 months of general experience started at $6,764 a year; graduates of an ADA-approved 1-year training program who had an additional year of general experience could expect to start at $7,596 a year.

Although the 40-hour workweek prevails for dental assistants, the schedule is likely to include work on Saturday. A 2- or 3-week paid vacation is common. Some dentists provide sick leave and other benefits. Dental assistants who work for the Federal Government receive the same employee benefits as other Federal workers.

Dental assistants work in a well-lighted, clean environment. They must be careful in handling X-ray and other equipment.

Sources of Additional Information

Information about career opportunities, scholarships, accredited dental assistant programs, including the correspondence program, and requirements for certification is available from:

American Dental Assistants Association, 211 E. Chicago Ave., Chicago, Ill. 60611.

Other material on opportunities for dental assistants is available from:

Division of Dental Health, Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C. 20201.

DENTAL HYGIENISTS

(D.O.T. 078.368)

Nature of the Work

Dental hygienists are oral health clinicians and educators who aid the public in developing and maintaining good oral health. As members of the dental health team, dental hygienists may perform preventive and therapeutic services under the supervision of the dentist. Specific responsibilities of the hygienist vary, depending on the law of the State where the hygienist is employed, but may include: removing deposits and stains from patients' teeth; providing instructions for patient self-care, and dietetic and nutritional counseling; and the application of medicine for the prevention of tooth decay. They take medical and dental histories, expose and develop dental X-ray films, make model impressions for study, and prepare other diagnostic aids for use by the dentist. Pain control and restorative procedures also are handled often by dental hygienists.

Dental hygienists who work in school systems examine children's teeth, assist dentists in determining the dental treatment needed, and report their findings to parents. They also clean teeth and give instruction on correct mouth care. Some help to develop classroom or assembly programs on oral health. Dental hygienists employed by health agencies work in dental clinics. A few assist in research projects. Those having advanced training may teach in schools of dental hygiene.

Places of Employment

Nearly 23,000 persons, most of them women, worked as dental hygienists in 1974. Many work part time. Most work in private dental offices. Public health agencies, school systems, industrial plants, clinics, hospitals, dental hygiene schools, and the Federal Government are other sources of employment for dental hygienists. Some who are graduates of bachelor's degree programs are commissioned officers in the Armed Forces.

Training and Other Qualifications

Dental hygienists must be licensed. To get a license, a candidate must be a graduate of an accredited dental hygiene school, except in Alabama, and pass both a written and clinical examination. In 1974, candidates in 49 States and the District of Columbia could complete part of the State licensing requirements by passing a written examination given by the National Board of Dental Examiners.

In order to practice in a different State, a licensed dental hygienist must pass the State's examination. However, at least 19 States grant licenses, without further examination, to dental hygienists already licensed in certain other States.

In 1975, 163 schools of dental hygiene in the United States were accredited by the American Dental Association. Most programs grant a certificate or an associate degree; others lead to a bachelor's degree. Some institutions offer both types of programs. Twelve schools offer master's degree programs.

Completion of an associate degree program is sufficient for dental hygienists who want to practice in a private dental office. In order to do research, teach, and work in public or school health programs, a baccalaureate degree usually is required.

The minimum requirement for

admission to a school of dental hygiene is graduation from high school. Several schools which offer the bachelor's degree admit students to the dental hygiene program only after they have completed 2 years of college. Many schools also require that applicants take an aptitude test given by the American Dental Hygienists Association.

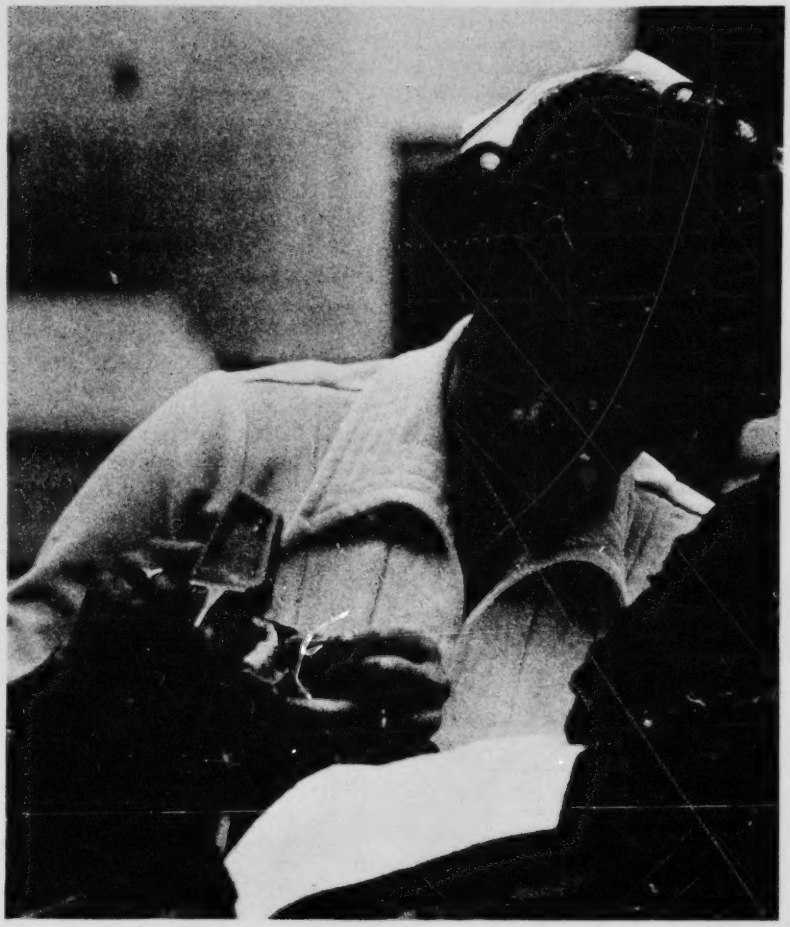
The curriculum in a dental hygiene program consists of courses in the basic sciences, dental sciences, and liberal arts. These schools offer laboratory work, clinical experience, and classroom instruction in subjects such as anatomy, chemistry, histology, periodontology, pharmacology, and nutrition.

People who want to become dental hygienists should be those who enjoy working with others. The ability to put patients at ease in an uncomfortable situation is helpful. Personal neatness and cleanliness, manual dexterity, and good health also are important qualities. Among the courses recommended for high school students interested in careers in this occupation are biology, health, chemistry, and speech.

Employment Outlook

Employment opportunities for dental hygienists are expected to be very good through the mid-1980's. Despite an anticipated rise in the number of graduates from schools of dental hygiene, the demand is expected to be greater than the number available for employment if current trends in enrollments continue. There also should be very good opportunities for those desiring part-time employment, and for those willing to work in rural areas.

Employment of dental hygienists is expected to grow much faster than the average for all occupations, because of an expanding population and the growing awareness of the importance of regular dental care. Increased participation in dental prepayment plans and more group practice among dentists will result in new jobs for dental hygienists. Dental care programs for children also may lead to more employment opportunities in this field.



Dental hygienists teach the techniques of mouth care.

Earnings and Working Conditions

Earnings of dental hygienists are affected by the type of employer, education and experience of the individual hygienist, and the geographic location. Dental hygienists who work in private dental offices usually are salaried employees, although some are paid a commission for work performed, or a combination of salary and commission.

Dental hygienists working full time earned average salaries of about $10,400 a year in 1974, according to the limited data available. This salary was slightly above the average for all nonsupervisory workers in private industry, except farming. In late 1974, the Federal Government paid dental hygienists with no experience starting salaries of $7,596 a year.

Dental hygienists employed full time in private offices usually worked between 35 and 40 hours a week. They may work on Saturdays or during evening hours. Some hygienists work for two dentists or more.

Dental hygienists usually work in clean, well-lighted offices. Important health protections for persons in this occupation are regular medical checkups and strict adherence to established procedures for using X-ray equipment and for disinfection.

Dental hygienists who work for school systems, health agencies, and the Federal or State governments have the same hours, vacation, sick leave, retirement, and health insurance benefits as other workers in these organizations.

Sources of Additional Information

For information about accredited programs and the educational requirements needed to enter this occupation, contact:

Office of Education, American Dental Hygienists Association, 211 E. Chicago Ave., Chicago, Ill. 60611.

Other material on opportunities for dental hygienists is available from:

Division of Dentistry, Public Health Service, U.S. Department of Health, Education, and Welfare, 9000 Rockville Pike, Bethesda, Md. 20014.

The State Board of Dental Examiners in each State, or the National Board of Dental Examiners, 211 E. Chicago Ave., Chicago, Ill. 60611, can supply information on licensing requirements.

DENTAL LABORATORY TECHNICIANS

(D.O.T. 712.381)

Nature of the Work

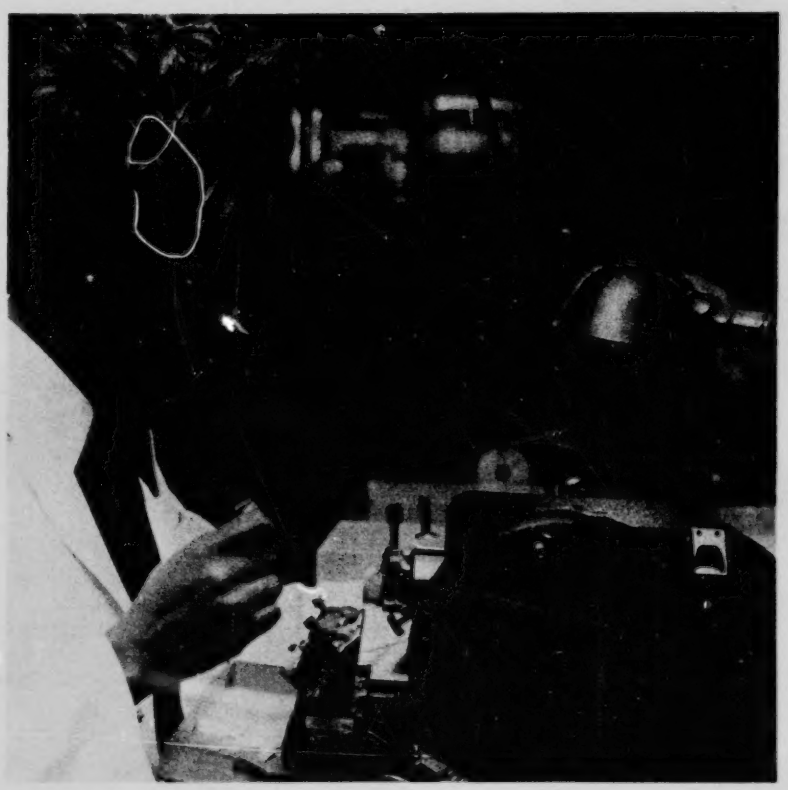
Dental technicians make dentures (artificial teeth), fabricate metal or porcelain crowns and inlays to restore teeth, construct bridges of metal and porcelain to replace missing teeth, and make other dental orthodontic appliances. All work is done following written instructions submitted by the dentist, using models and impressions made by the dentists of patients' teeth or mouths.

Trainees in beginning jobs usually mix and pour plaster into casts and molds and perform other simple tasks. As they gain experience, they do more difficult laboratory work. Some dental technicians do all kinds of laboratory work. Others are specialists who make crowns and bridges, arrange artificial teeth on dental appliances, process plastic materials, work with dental ceramics (porcelain), or make castings of gold or metal alloys. To perform their work, technicians use small hand instruments as well as special electric lathes and drills, high-heat furnaces, and other kinds of specialized laboratory equipment.

Places of Employment

About 32,000 persons worked as dental technicians in 1974; an estimated one-fifth were women. Most work in commercial laboratories, either as employees or as owners of the business. Commercial laboratories, which handle orders from dentists, usually employ fewer than 10 technicians. However, a few large laboratories employ over 200 technicians.

Almost 5,000 dental technicians work in dentists' offices. Others work for hospitals that provide dental services and for the Federal Government, chiefly in Veterans Administration hospitals and clinics and in the Armed Forces. Establishments that manufacture dental materials and equipment also employ dental technicians as technical or sales representatives.



Dental laboratories are located mainly in large cities and populous States.

Training, Other Qualifications, and Advancement

Although no minimum formal education is needed to enter this occupation, a high school diploma is an asset. Most dental technicians learn their craft on the job. This training usually lasts 4 or 5 years, depending on the trainee's previous experience, ability to master the techniques, and the number of specialized areas to be learned. A few public vocational high schools offer courses in dental laboratory work that may be taken in conjunction with on-the-job training.

In 1974, 2-year education programs accredited by the American Dental Association were offered in 38 schools. High school graduation or equivalent education is required to enter these programs. The first year of training includes formal classroom instruction in dental law and ethics, chemistry, ceramics, metallurgy, and other related subjects. During the second year, the student gets supervised practical experience in the school or dental laboratory. After completion of the 2-year training program, the trainee generally needs about 3 more years of practical experience to develop the skills needed in order to be recognized as a well-qualified dental technician.

Dental technicians may become Certified Dental Technicians after passing written and practical examinations given by the National Board for Certification, a trust established by the National Association of Dental Laboratories. Certification is becoming increasingly important as evidence of a technician's competence. Well-qualified technicians can advance to managers and supervisors.

Among the personal qualifications that employers look for in selecting trainees are a high degree of manual dexterity, good color perception, patience, and a liking for detailed work. High school students interested in careers in this occupation are advised to take courses in art, crafts, metal shop, blueprint reading, and sciences.

Employment Outlook

Job opportunities for well-qualified dental technicians are expected to be excellent through the mid-1980's. Some experienced technicians should be able to establish laboratories of their own. A technician whose work has become known to several dentists in a community will have the best prospects of building a successful business.

Employment of dental technicians is expected to grow faster than the average for all occupations due to expansion of dental prepayment plans and the increasing number of older people who require dentures. In addition, the number of dentists is not expected to keep pace with the demand for their services; to devote more time to treatment of patients, dentists will send more and more of their laboratory work to commercial firms, or hire dental technicians to work directly for them.

In addition to job opportunities created by growth, many openings for dental technicians will occur each year because of the need to replace technicians who transfer to other fields of work, retire, or die.

Earnings and Working Conditions

Dental technician trainees who worked in commercial laboratories earned an average of approximately $4,700 a year in 1974. Technicians with 5 years' experience or more in commercial laboratories generally earned between $10,500 and $14,300 a year, depending on their skill and experience. This was higher than the average earnings for all nonsupervisory workers in private industry, except farming. Technicians who specialized in ceramics received the highest salaries. Large dental laboratories employ supervisors or managers who usually earn more than technicians. In general, earnings of self-employed technicians are higher than those of salaried workers.

In the Federal Government, graduates of ADA-approved programs with no experience were paid starting salaries of $7,596 a year in late 1974. Experienced dental technicians employed in the Federal Government generally earned between $10,520 and $15,132 annually.

Salaried technicians usually work 40 hours a week but self-employed technicians frequently work longer hours. Many technicians in commercial laboratories receive paid holidays and vacations and some also receive paid sick leave, bonuses, and other fringe benefits. Technicians employed by the Federal Government have the same benefits as other Federal employees.

Sources of Additional Information

For information about training and a list of approved schools contact:

American Dental Association, Council on Dental Education, 211 E. Chicago Ave., Chicago, Ill. 60611.

Information on scholarships is available from dental technology schools or from:

The American Fund for Dental Education, 211 E. Chicago Ave., Chicago, Ill. 60611.

For information on career opportunities in commercial laboratories and requirements for certification, contact:

National Association of Dental Laboratories, 3801 Mt. Vernon Ave., Alexandria, Va. 22305.

MEDICAL PRACTITIONERS

Medical practitioners work to prevent, cure, and alleviate disease. This group includes almost four times as many physicians as all other practitioners combined.

Physicians, osteopaths, and chiropractors all treat diseases that affect the entire body; chiropractors and osteopaths emphasize manipulation of muscles and bones, especially the spine. Optometrists care for the eyes, and podiatrists care for foot diseases and deformities. Veterinarians treat animals.

All of these occupations are closely regulated. States require that medical practitioners be licensed and pass a State board exam. Only physicians, osteopaths, podiatrists, and veterinarians can use drugs and surgery in their treatment.

Among the six medical practitioner occupations, requirements for a license vary from 6 to 9 years of postsecondary education. After graduation from college, osteopaths must complete a 4-year program and physicians generally 3- or 4-year programs. Most States require a 1-year internship or residency for both physicians and osteopaths. Physicians who specialize must spend more years in residency and pass a specialty board examination. Most schools of chiropractic require that students complete 2 years of college preceding their 4-year program. Optometrists, podiatrists, and veterinarians all must complete a minimum of 2 years of college before beginning the 4-year program.

The proportion of women among the medical professions varies. All occupations have fewer than 10 percent. However, this number represents a growth over the past few years, and student enrollments indicate that this percentage will increase at an accelerated rate in the future.

All medical practitioners must have the ability and perseverance to complete the years of study required. Medical practitioners should be emotionally stable, able to make decisions in emergencies, and have a strong desire to help the sick and injured. Sincerity and the ability to relate to and gain the confidence of patients also are important qualities for medical practitioners.

CHIROPRACTORS

(D.O.T. 079.108)

Nature of the Work

Chiropractic is a system of treatment based on the principle that a person's health is determined largely by the nervous system, and that interference with this system impairs normal functions and lowers resistance to disease. Chiropractors treat patients primarily by manual manipulation of parts of the body, especially the spinal column.

Because of the emphasis on the spine and its position, most chiropractors use X-rays extensively to aid in locating the source of patients' difficulties. In addition to manipulation, some chiropractors use such supplementary measures as water, light, and heat therapy, and prescribe diet, exercise, and rest. Most State laws restrict the type of supplementary treatment

permitted in chiropractic. Chiropractic as a system for healing does not include the use of drugs or surgery.

Places of Employment

About 18,000 persons, 6 percent of them women, practiced chiropractic in 1974. Most chiropractors are in private practice. Some are salaried assistants of established practitioners or work for chiropractic clinics and industrial firms. Others teach or conduct research at chiropractic colleges. More than two-fifths of all chiropractors are located in California, Michigan, Missouri, New York, Pennsylvania, and Texas.

Training, Other Qualifications, and Advancement

All 50 States and the District of Columbia regulate the practice of chiropractic and grant licenses to chiropractors who meet certain educational requirements and pass a State board examination. Although the type of practice permitted and the educational requirements for a license vary considerably from one State to another,

most States require successful completion of a 4-year chiropractic course following 2 years of preprofessional college work. In addition, several States require that chiropractors pass a basic science examination. Chiropractors licensed in one State may obtain a license in most other States by reciprocity.

In 1974, there were 12 chiropractic colleges. All require 2 years of college before entrance, and some require that specific courses be taken during these 2 years. Most chiropractic colleges emphasize courses in manipulation and spinal adjustments. Others offer a broader curriculum, including subjects such as physiotherapy and nutrition. In most chiropractic colleges, the first 2 years of the curriculum are devoted chiefly to classroom and laboratory work in subjects such as anatomy, physiology, and biochemistry. During the last 2 years, students obtain practical experience in college clinics. The degree of Doctor of Chiropractic (D.C.) is awarded to students completing 4 years of chiropractic training.

Chiropractic requires considerable hand dexterity but not unusual strength or endurance. Persons desiring to become chiropractors should be able to work independently and handle responsibility. The ability to work with detail is important. Sympathy and understanding are among personal qualities considered desirable in dealing effectively with patients.

Most newly licensed chiropractors either set up a new practice or purchase an established one. Some start as salaried chiropractors to acquire experience and funds needed to establish their own practice. A moderate financial investment is usually necessary to open and equip an office.

Employment Outlook

The number of chiropractors is expected to increase faster than the average for all occupations to the mid-1980's as public acceptance of chiropractic healing continues to grow. In addition to openings that will result from increasing demand, an even greater number of chiropractors will be needed to replace those who die, retire, or leave the occupation for other reasons.

The supply of chiropractors, however, also has begun to expand rapidly. Enrollments in chiropractic colleges are growing dramatically, in apparent response to the broader public acceptance of the profession. As more students graduate and the number of active practitioners swells, new chiropractors may find it increasingly difficult to establish a practice in those areas where other practitioners already are located. The best opportunities for new chiropractors may be in areas with comparatively few established practitioners.

Earnings and Working Conditions

In chiropractic, as in other types of independent practice, earnings are relatively low in the beginning, but rise after the first few years. Incomes of chiropractors vary widely. Earnings for beginning chiropractors were between $12,000 and $15,000 a year in 1974. Experienced chiropractors earned an average of about $28,000, according to limited data available, although many earn considerably more.

Sources of Additional Information

The State board of licensing in the capital of each State can supply information on State licensing requirements.

General information on chiropractic as a career and a list of schools of chiropractic are available from:

American Chiropractic Association, 2200 Grand Ave., Des Moines, Iowa 50312.

International Chiropractors Association, 741 Brady St., Davenport, Iowa 52808.

For information on requirements for admission to a specific chiropractic college, contact the admissions office of that school.

OPTOMETRISTS

(D.O.T. 079.108)

Nature of the Work

About 1 out of every 2 persons in the United States needs eye care. Optometrists provide most of this care. They examine people's eyes for vision problems, disease, and other abnormal conditions, and test for proper depth and color perception and the ability to focus and coordinate the eyes. When necessary, they prescribe lenses and treatment. Where evidence of disease is present, the optometrist refers the patient to the appropriate medical practitioner. Most optometrists supply the prescribed eyeglasses and fit and adjust contact lenses. Optometrists also prescribe corrective eye exercises or other treatment not requiring drugs or surgery.

Although most optometrists are in general practice, some specialize in work with the aged or with children. Others work only with persons having partial sight who can be helped with microscopic or telescopic lenses. Still others are concerned with the visual safety of industrial workers. A few optometrists teach or do research.

Optometrists should not be confused with either ophthalmologists, sometimes referred to as oculists, or with dispensing opticians. Ophthalmologists are physicians who specialize in medical eye care, eye diseases and injuries, perform eye surgery, and prescribe drugs or other eye treatment, as well as lenses. Dispensing opticians fit and adjust

eyeglasses according to prescriptions written by ophthalmologists or optometrists; they do not examine eyes or prescribe treatment. (See statement on Dispensing Opticians.)

Places of Employment

In 1974, there were about 19,000 practicing optometrists. Although women currently make up only 3 percent of the profession, the proportion of women enrolled in optometry schools has been increasing in recent years.

Most optometrists are in solo practice. Others are in partnerships or group practice with other optometrists or doctors as part of a professional health care team.

Some optometrists work in specialized hospitals and eye clinics or teach in schools of optometry. Others work for the Veterans Administration, public and private health agencies, and industrial health insurance companies. About 500 optometrists serve as commissioned officers in the Armed Forces. Optometrists also may act as consultants to engineers specializing in safety or lighting, educators in remedial reading, or serve as members of health advisory committees to Federal, State, and local governments.

According to a recent survey, about 2 optometrists out of 5 practice in towns of under 25,000 inhabitants.

Training, Other Qualifications, and Advancement

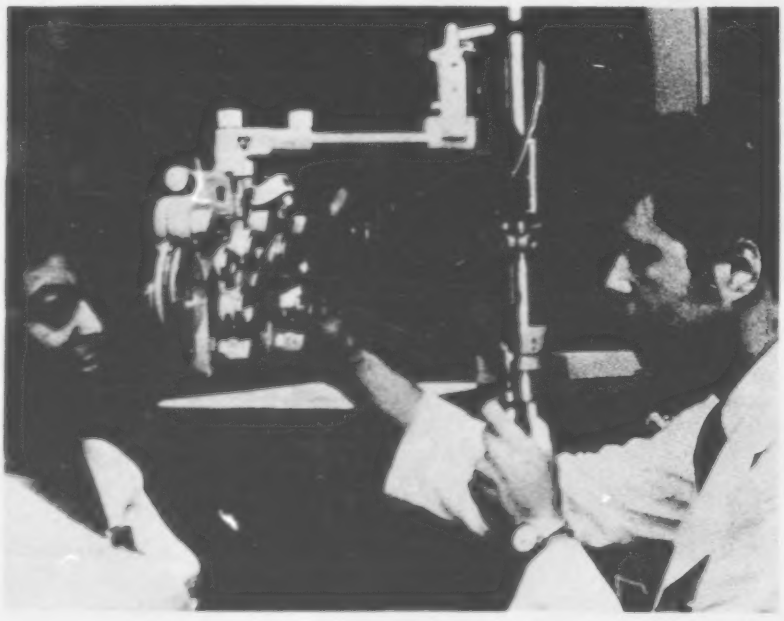
All States and the District of Columbia require that optometrists be licensed. Applicants for a license must have a Doctor of Optometry degree from an accredited optometric school and pass a State board examination. In some States, applicants are permitted to substitute the National Board of Optometry examination, given in the third and fourth year of optometric school, for part or all of the written State examination. Several States allow applicants to be licensed without lengthy examination if they have a license in another State.

The Doctor of Optometry degree requires a minimum of 6 years of college consisting of a 4-year professional degree program preceded by at least 2 years of preoptometric study at an accredited university, college, or junior college. In 1974, there were 12 schools and colleges of optometry approved by the Council on Optometric Education of the American Optometric Association. Requirements for admission to these schools usually include courses in English, mathematics, physics, chemistry, and biology, or zoology. Some schools also require courses in psychology, social studies, literature, philosophy, and foreign languages.

Since most optometrists are self-employed, business ability, self-discipline, and the ability to deal with patients tactfully are necessary for success.

Many beginning optometrists enter into associate practice with an optometrist or other health professional. Others either purchase an established practice or set up a new practice. Some take salaried positions to obtain experience and the necessary funds to enter their own practice.

Optometrists wishing to advance in a specialized field may study for a Master's or Doctor of Philosophy degree in physiological optics, neurophysiology, public health administration, health information and communication, or health education. Optometrists who enter the Armed Forces as career officers have the opportunity to work toward advanced degrees and to do vision research. requirements.



Employment Outlook

Employment opportunities for optometrists are expected to be favorable through the mid-1980's. The number of new graduates from

schools of optometry is expected to be adequate to fill the positions made available by employment growth and the need to replace optometrists who die and retire.

Employment of optometrists is expected to grow about as fast as the average for all occupations. An increase in the total population, especially in the groups most likely to need glasses—older people and white-collar workers—is the main factor contributing to the expected growth in the occupation. Greater recognition of the importance of good vision for efficiency at school and work, and the possibility that more persons will have health insurance to cover optometric services, also should increase the demand for optometric services.

Earnings and Working Conditions

In 1974, net earnings of new optometry graduates averaged about $13,500, while experienced optometrists averaged about $30,000 annually. Optometrists working for the Federal Government earned an average of $17,500 a year in late 1974. Incomes vary greatly, depending upon location, specialization, and other factors. Optometrists entering solo practice begin at approximately the same income level as those entering associateship or group practice. However, after several years, optometrists in associateship or partnership practice may earn substantially more than their solo practitioner counterparts.

Independent practitioners can set their own work schedule. Some work over 40 hours a week, including Saturday. Since the work is not physically strenuous, optometrists often can continue to practice after the normal retirement age.

Sources of Additional Information

Information on optometry as a career and a list of scholarships and loan funds offered by various State associations, societies, and institutions are available from:

American Optometric Association, 7000 Chippewa St., St. Louis, Mo. 63119.

Federal Health Professions Loans are available for optometric students who meet certain financial needs requirements. For information on this financial aid and on required preoptometry courses, contact individual optometry schools. The Board of Optometry in the capital of each State can supply a list of optometry schools approved by that State, as well as licensing requirements.

OSTEOPATHIC PHYSICIANS

(D.O.T. 071.108)

Nature of the Work

Osteopathic physicians diagnose and treat diseases or maladies of the human body. They are particularly concerned about problems involving the muscles or bones. One of the basic treatments or therapies used by osteopathic physicians centers on manipulating these systems with the hands. Osteopathic physicians also use surgery, drugs, and all other accepted methods of medical care.

Most osteopathic physicians are "family doctors" who engage in general practice. These physicians usually see patients in their offices, make house calls, and treat patients in osteopathic and some city and county hospitals. Some doctors of osteopathy teach, do research, or write and edit scientific books and journals.

In recent years, specialization has increased. In 1974, about 25 percent were practicing specialties including internal medicine, neurology and psychiatry, ophthalmology, pediatrics, anesthesiology, physical medicine and rehabilitation, dermatology, obstetrics and gynecology, pathology, proctology, radiology, and surgery.

Places of Employment

About 14,500 osteopathic physicians were practicing in the United States in 1974; nearly 9 percent were women. Nearly all osteopathic physicians were in private practice. Less than 5 percent had full-time salaried positions in osteopathic hospitals and colleges, private industry, or government agencies.

Osteopathic physicians are located chiefly in those States that have osteopathic hospital facilities. In 1974, almost half of all osteopathic physicians were in Michigan, Pennsylvania, New Jersey, Ohio, and Missouri. Twenty-three States and the District of Columbia each had fewer than 50 osteopathic physicians. More than half of all general practitioners are located in towns and cities having fewer than 50,000 people; specialists, however, practice mainly in large cities.

Training and Other Qualifications

A license to practice as an osteopathic physician is required in all States. To obtain a license, a

candidate must be a graduate of an approved school of osteopathy and pass a State board examination. In 13 States and the District of Columbia, candidates must pass an examination in the basic sciences before they are eligible to take the professional examination; 35 States and the District of Columbia also require a period of internship in an approved hospital after graduation from an osteopathic school. The National Board of Osteopathic Examiners also gives an examination which is accepted by some States as a substitute for state examination. All States except Alaska and California grant licenses without further examination to properly qualified osteopathic physicians already licensed by another State.

Although 3 years of preosteopathic college work is the minimum entrance requirement for schools of osteopathy, almost all osteopathic students have a bachelor's degree. Preosteopathic education must include courses in chemistry, physics, biology, and English. Osteopathic colleges require successful completion of 3 to 4 years of professional study for the degree of Doctor of Osteopathy (D.O.). During the first half of professional training, emphasis is placed on basic sciences such as anatomy, physiology, pathology, and on the principles of osteopathy; the remainder of the study is devoted largely to work with patients in hospitals and clinics.

After graduation, nearly all doctors of osteopathic medicine serve a 12-month internship at 1 of the 73 osteopathic hospitals that the American Osteopathic Association has approved for intern training. Those who wish to become specialists must have 2 to 5 years of additional training, followed by 2 years of supervised practice in the specialty.

The osteopathic physician's training is very costly because of the length of time it takes to earn the D.O. degree. However, Federal funds provide a limited number of loans for students, and scholarships are available to those who qualify and agree to a minimum of 2 years' Federal service.

The seven schools of osteopathy admit students on the basis of grades received in college, scores on the required Medical College Admissions Test, and the amount of preosteopathic college work completed. The applicant's desire to serve as an osteopathic physician rather than as a doctor trained in other fields of medicine is a very important qualification. The colleges also give considerable weight to a favorable recommendation by an osteopathic physician familiar with the applicant's background.

Newly qualified doctors of osteopathic medicine usually establish their own practice, although a growing number are entering group practice. A few work as assistants to experienced physicians or become associated with osteopathic hospitals. In view of the variation in State laws, persons who wish to become osteopathic physicians should study carefully the professional and legal requirements of the State in which they plan to practice. The availability of osteopathic hospitals and clinical facilities also should be considered.

Persons who wish to become osteopathic physicians must have a strong desire to practice osteopathic principles of healing. They must be willing to study a great deal throughout their career to keep up with the latest advances in osteopathic medicine. They should have a keen sense of touch, emotional stability, and self-confidence. A pleasant personality, friendliness, patience, and the ability to deal with people also are important.

Employment Outlook

Opportunities for osteopathic physicians are expected to be very good through 1980. With the planned expansion of schools of osteopathic medicine, by 1985 the number of osteopathic physicians available is expected to be in rough balance with the openings created by growth in the occupation and by those who die or retire from the profession. Greatest demand probably will continue to be in States where osteopathic medicine is a widely accepted method of treatment, such as Pennsylvania and a number of Midwestern States. Generally, prospects for beginning a successful practice are likely to be best in rural areas, small towns, and city suburbs, where young doctors of osteopathy may establish their professional reputations more easily than in the centers of large cities.

The osteopathic profession is expected to grow faster than the average for all occupations through the mid-1980's because of the extension of prepayment programs for hospitalization and medical care including Medicare and Medicaid, population growth, and the establishment of additional osteopathic hospital facilities.

Earnings and Working Conditions

In osteopathic medicine, as in many of the other health professions, incomes usually rise markedly after the first few years of practice. Earnings of individual practitioners are determined mainly by ability, experience, geographic location, and the income level of the community served. In 1974, the average income of general practitioners after business expenses was about $31,000, according to the limited data available. This income is very high in comparison with other professions. Specialists usually had higher incomes than general practitioners.

Many osteopathic physicians work more than 50 or 60 hours a week. Those in general practice work longer and more irregular hours than specialists.

Sources of Additional Information

People who wish to practice in a given State should find out about the requirements for licensure directly from the board of examiners of that State. Information on Federal scholarships and loans is available from the Director of Student Financial Aid at the individual schools of osteopathy. For a list of State boards, as well as general information on osteopathy as a career, contact:

American Osteopathic Association, Office of Osteopathic Education, 212 East Ohio St., Chicago, Ill. 60611.

American Association of Colleges of Osteopathic Medicine, 4720 Montgomery Lane, Washington, D.C. 20014.

PHYSICIANS

(D.O.T. 070.101 and .108)

Nature of the Work

People in the United States visit a physician on the average of about 5 times a year either for treatment of an illness or injury or else for a routine checkup. Physicians diagnose diseases and treat people who are suffering from injury or disease. They also try to prevent illness by advising patients on self-care related to diet and exercise. Physicians generally examine and treat patients in their own offices and in hospitals, but they also may visit patients at home.

A decreasing percentage of the physicians who provide patient care (about one-fifth in 1974) are general practitioners; the others specialize in one of the 52 fields for which there is graduate training. The largest specialties are internal medicine, general surgery, obstetrics and gynecology, psychiatry, pediatrics, radiology, anesthesiology, ophthalmology, pathology, and orthopedic surgery.

Some physicians combine the practice of medicine with research or teaching in medical schools. Others hold full-time research or teaching positions or perform administrative work in hospitals, professional associations, and other organizations. A few are primarily engaged in writing and editing medical books and magazines.

Places of Employment

About 335,000 physicians were professionally active in the United States in 1974; about 7 percent of them were women. The recent increase in female enrollment in medical schools points to a larger number of women doctors in the future.

About 9 out of 10 physicians provided patient care services. Nearly 200,000 of these had office practices; more than 91,000 others worked as residents or full-time staff in hospitals. The remaining physicians—about 29,000—taught or performed administrative or research duties.

In 1975, 19,000 graduates of foreign medical schools served as hospital residents in this country. To be appointed to approved residencies in U.S. hospitals, these graduates, except in special instances, must obtain a certificate after passing an examination given by the Educational Commission for Foreign Medical Graduates.

The Northeastern States have the highest ratio of physicians to population and the Southern States the lowest. General practitioners are much more widely spread geographically than specialists, who tend to be concentrated in large cities.

Training and Other Qualifications

All States and the District of Columbia require a license to practice medicine. To qualify for a

license, a candidate must be a graduate of an approved medical school, pass a licensing examination, and in 34 States and the District of Columbia serve a 1-year hospital residency. Eleven States require candidates to pass a special examination in the basic sciences to become eligible for the licensing examination.

Licensing examinations are given by State boards. The National Board of Medical Examiners also gives an examination which is accepted by 48 States and the District of Columbia as a substitute for State examinations. Although physicians licensed in one State usually can get a license to practice in another without further examination, some States limit this reciprocity.

In 1974, there were 114 approved schools in the United States in which students could begin the study of medicine. Of these, 103 awarded the degree of Doctor of Medicine (M.D.); one school offered a 2-year program in the basic medical sciences to students who could then transfer to regular medical schools for the last semesters of study.

Most medical schools require applicants to have completed at least 3 years of college education; some require 4 years. A few medical schools allow selected students who have exceptional qualifications to begin their professional study after 2 years of college. Most students who enter medical schools have a bachelor's degree.

Courses necessary for premedical study include undergraduate work in English, physics, biology, and inorganic and organic chemistry. Students should take courses in the humanities, mathematics, and the social sciences to acquire a broad general education. Other factors considered by medical schools in admitting students include their college records and their scores on the Medical College Admission Test, which is taken by almost all applicants. Consideration also is given to the applicant's character, personality, and leadership qualities, as shown by personal interviews, letters of recommendation, and extracurricular activities in college. Many State-supported medical schools give preference to residents of their particular States and sometimes, those of nearby States.

The traditional 4-year course of study leading to the M.D. degree is offered by 50 medical schools. In the remaining schools, students with demonstrated ability may be allowed to pursue a shortened curriculum. Most of these last 3 years, but a few schools offer the M.D. degree within 6 years of high school graduation.

The first semesters of medical school training are spent primarily in laboratories and classrooms, learning basic medical sciences such as anatomy, biochemistry, physiology, pharamacology, microbiology, and pathology. During the last semesters, students spend most of their time in hospitals and clinics under the supervision of experienced physicians. They learn to take case histories, perform examinations, and recognize diseases.

Many new physicians acquire training beyond the 1-year hospital residency. Those who plan to be general practitioners often spend an additional year or two as hospital residents. To become certified specialists, physicians must pass specialty board examinations. To qualify for these examinations, they must spend from 2 to 4 years—depending on the specialty—in advanced hospital training as residents, followed by 2 years or more of practice in the specialty. Some doctors who want to teach or do research take graduate work leading to the master's or Ph. D. degree in a field such as biochemistry or microbiology.

Medical training is very costly because of the long time required to earn the medical degree. However, many private scholarships and loans are available for medical education. In addition, Federal funds provide a limited number of loans for students, and scholarships are available to those who qualify and agree to a minimum of 2 years' Federal service.

Persons who wish to become physicians must have a strong desire to serve the sick and injured. They must be willing to study a great deal to keep up with the latest advances in medical science. Sincerity and a pleasant personality are assets that help physicians gain the confidence of patients. Prospective physicians should be emotionally stable and able to make decisions in emergencies.

The majority of newly qualified physicians open their own offices or join associate or group practices. Those who have completed 1 year of graduate medical education (a 1-year residency) and enter active military duty initially serve as captains in the Army or Air Force or as lieutenants in the Navy. Graduates of medical schools are eligible for commissions as senior assistant surgeons (equivalent to lieutenants in the Navy) in the U.S. Public Health Service, as well as for Federal Civil Service professional medical positions.

Employment Outlook

The employment outlook for physicians is expected to be very good through the mid-1980's. However, anticipated increases in the numbers of graduates of existing and developing U.S. medical schools, combined with foreign medical graduate entrants point to a greatly improved supply situation. This may result in an increasing movement of physicians into rural and other areas which have experienced shortage conditions in the past. Also, some specialties will have sufficient numbers of practitioners by 1980 or 1985 so that new graduates will be encouraged to specialize in one of the primary

care areas such as family practice, pediatrics, or internal medicine.

Foreign medical graduates are a large part of the new supply of physicians each year. In 1974, 2 new physicians out of 5 were foreign medical graduates.

Even though the number of medical schools has increased in the last few years, the competition for first-year places in medical school is intense. In 1974, there were about 40,000 applicants for 14,000 positions.

Growth in population will create much of the need for more physicians, and a larger percentage of the population will be in the age group over 65, which uses increased physicians' services. Also, the effective demand for physicians' care will increase because of greater ability to pay, resulting from extension of prepayment programs for hospitalization and medical care, including Medicare and Medicaid, and continued Federal Government provision of medical care for members of the Armed Forces, their families, and veterans. More physicians will be needed, in addition, for medical research, teaching in medical schools, and the continuing growth in the fields of public health, rehabilitation, industrial medicine, and mental health.

Recent concern over the distribution of physicians between specialties and general practice has resulted in creation of Federal funds for promotion of programs in family medicine. The new specialty of family practice has grown very rapidly since 1971, in keeping with the need for more M.D.'s who treat a variety of the more common illnesses.

To some extent, the rise in the demand for physicians' services will be offset by developments that will enable physicians to care for more patients. For example, increasing numbers of medical technicians are assisting physicians; new drugs and new medical techniques are shortening illnesses; and growing numbers of physicians are using their time more effectively by engaging in group practice or treating patients in physicians' offices or hospitals, rather than making house calls.

The extent to which the developing health occupations, such as those of physicians' assistants and nurse practitioners, will enable each physician to treat more patients is as yet unknown. It is possible that these new health personnel will decrease the physicians' work significantly. In addition, legislation was passed in 1972 authorizing the Veterans Administration to assist States in the establishment of up to eight new medical schools. As of early 1975, plans were under way for two of these schools to enroll their first students in 1976. Either a large increase in the number of physicians or the ability of each practitioner to treat more patients could force more physicians to establish their practice in sections of the country which have few doctors and to choose general practice or family medicine instead of one of the other specialties.

Earnings and Working Conditions

In 1974, medical school graduates serving as residents earned average annual salaries of $11,249 in hospitals affiliated with medical schools, and $12,015 in nonaffiliated hospitals, according to the American Medical Association. Many hospitals also provided full or partial room, board, and other maintenance allowances to their residents.

Graduates employed by the Federal Government in late 1974 earned an annual starting salary of about $15,500 if they had completed a 1-year post-medical school residency, and about $18,500 if they had completed 2 years of residency.

Newly qualified physicians who establish their own practice must make a sizable financial investment to equip a modern office. During the first year or two of independent practice, physicians probably earn little more than the minimum needed to pay expenses. As a rule, however, their earnings rise rapidly as their practice develops.

Physicians have the highest average annual earnings of any occupational group. The net income of physicians who provided patient care services averaged about $49,500 in 1974, according to the limited information available. Earnings of physicians depend on factors such as the region of the country in which they practice; the patients' income levels; and the physician's skill, personality, and professional reputation, as well as the length of experience. Self-employed physicians usually earn more than those in salaried positions, and specialists usually earn considerably more than general practitioners. Many physicians have long working days and irregular hours. Most specialists work fewer hours each week than general practitioners. As doctors grow older, they may accept fewer new patients and tend to work shorter hours. However, many continue in practice well beyond 70 years of age.

Sources of Additional Information

Persons who wish to practice in a given State should find out about the requirements for licensure directly from the board of medical examiners of that State. Information on Federal scholarships and loans is available from the director of student financial aid at the individual medical schools. For a list of approved medical schools, as well as general information on premedical education, financial aid, and medicine as a career, contact:

Council on Medical Education, American Medical Association, 535 N. Dearborn St., Chicago, Ill. 60610.

Association of American Medical Colleges, Suite 200, One Dupont Circle, NW., Washington, D.C. 20036.

PODIATRISTS

(D.O.T. 079.108)

Nature of the Work

Podiatrists diagnose and treat foot diseases and deformities. They perform surgery, fit corrective devices, and prescribe drugs, physical therapy, and proper shoes. To help in diagnoses, they take X-rays and perform or prescribe blood and other pathological tests. Among the conditions podiatrists treat are corns, bunions, calluses, ingrown toenails, skin and nail diseases, deformed toes, and arch disabilities. They refer patients to medical doctors whenever the feet show symptoms of medical disorders affecting other parts of the body—such as arthritis, diabetes, or heart disease.

Some podiatrists specialize in foot surgery, orthopedics (bone, muscle, and joint disorders), podopediatrics (children's foot ailments), or podogeriatrics (foot problems of the elderly). However, most provide all types of foot care.

Places of Employment

About 7,500 persons practiced podiatry in 1974, 6 percent of them women. Most podiatrists practice in large cities. Those who had full-time salaried positions worked mainly in hospitals, podiatric colleges, or for other podiatrists. The Veterans Administration and public health departments employ podiatrists on either a full- or part-time basis. Others serve as commissioned officers in the Armed Forces.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require a license for the practice of podiatry. To qualify for a license, an applicant must graduate from an accredited program in a college of podiatric medicine and pass a State board examination. Three States—Michigan, New Jersey, and Rhode Island—also require applicants to serve a 1-year internship in a hospital or clinic after graduation. Three-fourths of the States grant licenses without further examination to podiatrists licensed by another State.

Applicants to the six colleges of podiatric medicine must have completed at least 2 years of college including courses in English, chemistry, biology or zoology, physics, and mathematics. About 90 percent of all applicants have a bachelor's degree.

The first 2 years in podiatry school include classroom instruction and laboratory work in basic sciences such as anatomy, bacteriology, chemistry, pathology, physiology, and pharmacology. During the final 2 years, students obtain clinical experience. The degree of Doctor of Podiatric Medicine (D.P.M.) is awarded upon graduation. Additional education and experience are generally necessary to practice in a specialty. A limited number of Federal loans are available for needy students to pursue full-time study leading to a degree in podiatry.

Young people planning a career in podiatry should have scientific aptitude and manual dexterity, and like detailed work. A good business sense, congeniality, and a sense of responsibility are additional assets in the profession.

Most newly licensed podiatrists set up their own practices. Some purchase established practices, or obtain salaried positions to gain the experience and money needed to begin their own.

Employment Outlook

Opportunities for graduates to establish new practices, as well as to enter salaried positions, should be favorable through the 1970's.

Through the mid-1980's, employment of podiatrists is expected to grow about as fast as the average for all occupations as a result of greater demand for health services by an expanding population, particularly the growing number of older people. This age group, the one needing the most foot care, is entitled to certain podiatrists' services under Medicare. Furthermore, the trend toward providing preventive foot care for children is increasing. More podiatrists also will be needed to furnish services in hospitals, extended care facilities, and public health programs.

Earnings and Working Conditions

Experience and the income level and location of the community served have a great effect on earnings of individual podiatrists. Those in practice between 1 and 3 years earned an average net income of about $20,000 in 1974, according to the limited available information. Net incomes of podiatrists with from 3 to 6 years of practice averaged about $35,000.

The workweek is generally 40 hours, and they may set their hours to suit their practice.

Sources of Additional Information

Information on license requirements in a particular State is availa-

ble from the State board of examiners in the State capital.

Information on colleges of podiatric medicine, entrance requirements, curriculums, and scholarships is available from:

American Association of Colleges of Podiatric Medicine, 20 Chevy Chase Circle, NW., Washington, D.C. 20015.

For additional information on podiatry as a career, contact:

American Podiatry Association, 20 Chevy Chase Circle, NW., Washington, D.C. 20015.

VETERINARIANS

(D.O.T. 073.081 through .281)

Nature of the Work

Veterinarians (doctors of veterinary medicine) diagnose, treat, and control diseases and injuries among animals. Their work is important for the Nation's food production. It is also important for public health, because it helps to prevent the outbreak and spread of animal diseases, many of which can be transmitted to human beings.

Veterinarians treat animals in hospitals and clinics or on the farm and ranch. They perform surgery on sick and injured animals and prescribe and administer drugs, medicines, and vaccines.

About one-third of all veterinarians treat small animals or pets exclusively. About the same number treat a mix of both large and small animals. A large number specialize in the health and breeding of cattle, poultry, sheep, swine, or horses. Many veterinarians inspect meat, poultry, and other foods as part of Federal and State public health programs. Others teach in veterinary colleges. Some do research related to animal diseases, foods and drugs, or work as part of a medical research team to seek knowledge about prevention and treatment of human disease.

Places of Employment

There were about 29,000 veterinarians active in 1974—3 percent of them women. About 7 out of 10 veterinarians were in private practice. The Federal Government employed about 2,500 veterinarians, chiefly in the U.S. Department of Agriculture and the U.S. Public Health Service. About 800 more were commissioned officers in the veterinary services of the Army and Air Force. Other employers of veterinarians are State and local government agencies, international health agencies, colleges of veterinary medicine, medical schools, research and development laboratories, large livestock farms, animal food companies, and pharmaceutical companies that manufacture drugs for animals.

Although veterinarians are located in all parts of the country, the type of practice generally varies according to geographic setting. Veterinarians in rural areas chiefly treat farm animals; those in small towns usually engage in general practice; those in cities and suburban areas often limit their practice to pets.

Training, Other Qualifications, and Advancement

Veterinarians must be licensed to practice in all States and the District of Columbia. To obtain a license, applicants must have a Doctor of Veterinary Medicine (D.V.M. or V.M.D.) degree and pass a State board examination. A few States also require that applicants have some practical ex-

perience under the supervision of a licensed veterinarian. Some States issue licenses without further examination to veterinarians already licensed by another State.

For positions in research and teaching, an additional master's or Ph. D. degree usually is required in a field such as pathology, physiology, or bacteriology.

Minimum requirements for the D.V.M. or V.M.D. degree are 2 years of preveterinary college work that emphasize the physical and biological sciences, followed by 4 years of study in a college of veterinary medicine. However, two professional schools require 3 years of preveterinary study. Most veterinary school applicants have completed 3 to 4 years of college before entering the professional program. Veterinary college training includes considerable practical experience in diagnosing and treating animal diseases and performing surgery, and laboratory work in anatomy, biochemistry, and other scientific and medical subjects.

There were 19 colleges of veterinary medicine in the United States in 1974. When selecting students for admission, these colleges considered primarily the applicants' scholastic records and the amount and character of their preveterinary training. Residents of the State in which each college is located usually are given preference by that college since these schools are largely State supported. In the South and West, regional educational plans permit cooperating States without veterinary schools to send students to designated regional schools. In other areas, colleges which accept a certain number of students from other States usually give priority to applicants from nearby States that do not have veterinary schools.

Federal funds provide a limited number of loans for needy students pursuing full-time study leading to the degree of Doctor of Veterinary Medicine.

Most veterinarians begin as employees or partners in established practices. A few start their own practices with a modest financial investment in drugs, instruments, and an automobile. With a more substantial investment, one may open an animal hospital or purchase an established practice. Newly qualified veterinarians may enter the Army and Air Force as commissioned officers, or qualify for Federal positions as meat and poultry inspectors, disease-control workers, epidemiologists, research assistants, or commissioned officers in the U.S. Public Health Service.

Employment Outlook

Employment opportunities for veterinarians are expected to be favorable through the mid-1980's. Veterinary employment is expected to grow faster than the average for all occupations through the mid-1980's, primarily because of growth in the pet population, an increase in the numbers of livestock and poultry needed to feed an expanding population, and an increase in veterinary research. Emphasis on scientific methods of raising and breeding livestock and poultry and growth in public health and disease control programs also will contribute to the demand for veterinarians.

Earnings and Working Conditions

Newly graduated veterinarians employed by the Federal Government started at $13,697 a year in late 1974. Salaries of experienced veterinarians employed by the Department of Agriculture ranged between $17,500 and $35,000 a year. The incomes of veterinarians in private practice vary considerably, depending on such factors as location, type of practice, and years of experience, but usually are higher than those of other veterinarians, according to the limited data available.

Veterinarians sometimes may be exposed to danger of injury, disease, and infection. Those in private practice often have long and irregular working hours. Veterinarians in rural areas may have to spend much time traveling to and from farms and may have to work outdoors in all kinds of weather. Because they are self-employed, veterinarians in private practice usually can continue working well beyond normal retirement age.

Sources of Additional Information

A pamphlet entitled *Today's Veterinarian* presents additional information on veterinary medicine as a career, as well as a list of colleges of veterinary medicine. A free copy may be obtained by submitting a request, together with a self-addressed stamped business size envelope, to:

American Veterinary Medical Association, 930 N. Meacham Rd., Schaumburg, Ill. 60172.

Information on opportunities for veterinarians in the U.S. Department of Agriculture is available from:

Agricultural Research Service, U.S. Department of Agriculture, Hyattsville, Md. 20782.

Animal and Plant Health Inspection Service, Personnel Division, 12th and Independence Ave. SW., Washington, D.C. 20250.

Agricultural Marketing Service, Personnel Division, 12th and Independence Ave. SW., Washington, D.C. 20250.

Students seeking loan or scholarship assistance should send inquiries to the schools in which they are interested.

MEDICAL TECHNOLOGIST, TECHNICIAN, AND ASSISTANT OCCUPATIONS

This section deals in detail with nine health occupations that are technical or clerical in nature. Many of these occupations were developed to relieve highly trained professionals of their less complicated and routine duties: *Medical assistants* in doctors' offices, for example, assist with patient care as well as do clerical work. *Optometric assistants* give preliminary eye examinations and help patients do prescribed eye exercises.

The development of sophisticated diagnostic tools and techniques for treatment, brought about by advances in medical science and technology, also has created the need for workers such as *electrocardiograph technicians* who operate equipment that monitors a patient's heart action, and *electroencephalographic technicians* who operate equipment that monitors the electrical activity of a patient's brain.

Medical record technicians and clerks process the large numbers of medical records generated daily in hospitals and nursing homes.

ELECTROCARDIOGRAPH TECHNICIANS

(D.O.T. 078.368)

Nature of the Work

Electrocardiograms (EKG's) are graphic heartbeat tracings produced by an instrument called an electrocardiograph. These tracings record the electrical changes that occur during a heartbeat. Physicians use electrocardiograms to diagnose irregularities in heart action and to analyze changes in the condition of a patient's heart over a period of time. Some physicians order electrocardiograms as a routine diagnostic procedure for persons who have reached a specified age. Electrocardiograms are required as part of preemployment physical examinations for young people in many fields. In some cases, the tests also are used if surgery is to be performed.

At the request of a physician, electrocardiograms can be recorded in a doctor's office, in the EKG department of a hospital, or at the patient's bedside, since the equipment is mobile. The technician straps electrodes to specified parts of the patient's body, manipulates switches of the electrocardiograph, and moves electrodes across the patient's chest. The technician must know the anatomy of the chest and heart to properly select the exact locations for the chest electrodes, since the wrong selection yields an inaccurate diagnosis. The test may be given while the patient is at rest, or before and after mild exercise.

The electrocardiograph records the "picture" of the patient's heart action on a continuous roll of paper. The technician then clips and mounts this electrocardiogram for analysis by a physician, usually a heart specialist. Technicians must recognize and correct any technical errors in the machine. They also must call the doctor's attention to any significant deviations from the norm.

EKG technicians sometimes conduct other tests such as vectorcardiograms which are three-dimensional traces, and phonocardiograms, which record the sounds of the heart valves and blood passing through them. In addition, technicians usually schedule appointments, type doctors' diagnoses, maintain patients' EKG files, and care for equipment.

Places of Employment

About 11,000 people—mostly women—worked as electrocardiograph technicians in 1974. Most EKG technicians worked in cardiology departments of large hospitals. Others worked part time in small general hospitals where workloads are usually not great enough to demand full-time technicians. Some worked full or part time in clinics and doctors' offices.

Training, Other Qualifications, and Advancement

Generally, EKG technicians are trained on the job. Training—usually conducted by an EKG supervisor or a cardiologist—lasts from 3 to 6 months for the basic EKG tests and up to 1 year for the more complex ones. Vocational schools in several states and junior colleges give college credit for car-

diology technology courses, and some colleges are planning to add cardiology technology to their curricula. Generally, the minimum educational requirement for the job is high school graduation. Among high school courses that are recommended for students interested in this field are health, biology, and typing. Familiarity with medical terminology is also helpful.

The military services and some manufacturers of electrocardiographs give training in operating these machines.

Persons who want to become EKG technicians should have mechanical aptitude, the ability to follow detailed instructions, presence of mind in emergencies, reliability, and patience.

Though opportunities for advancement generally are limited, large hospitals sometimes promote EKG technicians to supervisors. Advancement to junior cardiovascular technician also is possible.

Employment Outlook

The employment of EKG technicians is expected to grow faster than the average for all occupations because of increasing reliance on electrocardiograms to diagnose heart diseases and for physical examinations of older patients. Also contributing to the expected growth of this occupation is the increased demand for health services in general, as a result of greater health consciousness, new medical techniques and drugs, and extension of prepayment programs that make it easier for people to pay for health and medical care.

In addition to openings from growth, workers will be needed to replace technicians who die, retire, or leave the field for other reasons.

Earnings and Working Conditions

EKG technicians in hospitals and medical centers earned starting salaries of about $6,200 a year in 1974, according to a survey conducted by the University of Texas Medical Branch. Experienced EKG technicians, in some cases, earned as much as $11,500 a year.

Inexperienced EKG technicians with the Federal Government earned $5,996 a year in late 1974; a few experienced technicians earned as much as $11,047 a year.

EKG technicians in hospitals receive the same fringe benefits as other hospital personnel, including hospitalization, vacation, and sick leave benefits. Some institutions provide tuition assistance or free education courses, pension programs, and uniforms. Technicians generally work a 40-hour week, which may include Saturdays.

Sources of Additional Information

Local hospitals can supply information about employment opportunities. For additional information about the work of EKG technicians, contact:

American Hospital Association, 840 North Lake Shore Dr., Chicago, Ill. 60611.

Miss Ruth Jackson, President, American Cardiology Technologists Association, Scott and White Clinic, Temple, Tex. 76501.

ELECTROENCEPHALOGRAPHIC TECHNICIANS

(D.O.T. 078.368)

Nature of the Work

Electroencephalographic (EEG) technicians fulfill an important function in the diagnosis of brain disease and infections through electroencephalography—an electronic system which records in graphic form the electrical activity of the brain.

Neurologists and other professionals use EEG's to help diagnose such disorders as epilepsy and tumors, and assess damage and recovery after head injuries and cerebral vascular strokes. Use of EEG's in pinpointing the time brain functions stop has also made them very important in vital organ transplant operations.

To carry out the procedure, the EEG technician attaches electrodes leading from the patient's head to the electroencephalograph. The complex machine detects and graphs (EEG's)the electrical activity of the patient's brain. Interpretation of the electroencephalograms is done by professional EEG personnel, electroencephalographers, neurologists, and neurosurgeons. However, the EEG technician must have some knowledge of medicine, anatomy, and physiology to select correct machine settings, ensure a certain level of consciousness, and apply additional electrodes and techniques to elicit abnormalities that are specific to certain disorders.

EEG technicians schedule appointments, record services performed, and make routine repairs to equipment.

Places of Employment

About 3,800 persons—mostly women—worked as electroencephalographic technicians in 1974. Although EEG technicians work primarily in the neurology departments of hospitals, many work in private offices of neurologists and neurosurgeons.

Training, Other Qualifications, and Advancement

Most EEG technicians working in 1974 were trained on the job by experienced EEG personnel. However, with advances in medical technology, electroencephalograph equipment becomes increasingly sophisticated and requires technicians with more training.

In recognition of the need for educational programs for EEG technicians, the Council on Medical Education of the American Medical Association, in collaboration with the American Electroencephalographic Society, the American Medical Electroencephalographic Association, and the American Society of Electroencephalographic Technologists, developed a set of standards for use in the establishment of educational programs for EEG technicians and technologists. These standards recommend that programs last from 1 to 2 years and include laboratory experience as well as classroom instruction in neurology, anatomy, neuroanatomy, physiology, neurophysiology, clinical and internal medicine, psychiatry, and electronics and instrumentation. Programs may be carried on in colleges, junior colleges, medical schools, hospitals, vocational or technical schools. In 1973, these standards were adopted by the American Medical Association's house of delegates.

EEG technicians who have 1 year of training and a year of laboratory experience, and successfully complete a written and oral examination administered by the American Board of Registration of Electroencephalograph Technologists (ABRET), are designated "Registered EEG Technologist" (R.EEG.T.). Although not a general requirement for employment, registration by ABRET is acknowledgment of a technician's qualifications, and makes better-paying jobs easier to obtain.

People who want to enter this field should have manual dexterity, good vision, an aptitude for working with electronic equipment, and the ability to work with patients as well as with other members of the hospital team. High school students considering a career in this occupation are advised to take courses in health, biology, and electronics.

Some EEG technicians in large hospitals advance to chief EEG technician or technologist and have increased responsibilities in laboratory management and in teaching basic techniques to new personnel. Chief EEG technicians are supervised by an electroencephalographer, or a neurologist or neurosurgeon.

Employment Outlook

The employment of EEG technicians is expected to grow faster than the average for all occupations due to the increased use of EEG's in surgery and in the diagnosing and monitoring of patients with brain disease. Contributing to the overall increase in health services and the need for EEG technicians and technologists are greater health consciousness and more prepaid health programs. Registered EEG Technologists will have the best employment opportunities.

In addition to openings from growth, many openings will arise when workers retire or leave the field for other reasons.

Earnings and Working Conditions

Starting salaries of EEG technicians employed by hospitals and medical centers averaged $6,700 a year in 1974, according to a survey by the University of Texas Medical Branch. Starting salaries for Registered EEG Technologists were $1,000 to $2,000 higher. Top salaries of experienced EEG technicians ranged as high as $12,700 a year. Highly qualified technicians may earn more as teachers in special training situations.

Inexperienced EEG trainees em-

ployed by the Federal Government received $5,996 a year in late 1974, but they could advance to as much as $11,047 a year.

EEG technicians in hospitals receive the same benefits as other hospital personnel, including hospitalization, vacation, and sick leave benefits. Some institutions may provide tuition assistance or free courses, pension programs, uniforms, and parking.

EEG technicians generally work a 40-hour week with little overtime, although some hospitals require a standby emergency service after hours, weekends, and holidays.

Sources of Additional Information

Local hospitals can supply information about employment opportunities. Additional information is available from:

American Hospital Association, 840 North Lake Shore Dr., Chicago, Ill. 60611.

For information on registration, contact:

Ms. Lee Berger, R. EEG T., Registrar of A.B.R.E.T., EEG Laboratory, University Hospitals, 225 Dickenson St., San Diego, Calif. 92103.

MEDICAL ASSISTANTS

(D.O.T. 079.368)

Nature of the Work

Medical assistants help physicians examine and treat patients and perform the administrative tasks required to keep an office running smoothly.

In helping physicians examine patients, medical assistants may check weight, height, temperature, and blood pressure, and perform simple laboratory tests. In helping with treatment, they instruct patients about medication and self-treatment at home. Some may give injections, apply bandages, take electrocardiograms, and assist with X-rays. They also sterilize and clean instruments and perform routine tasks such as preparation of patients for examination, medical treatment, and minor office surgery.

Medical assistants also perform a variety of secretarial and administrative jobs. They keep patients' medical records, fill out medical and insurance forms, handle correspondence, schedule appointments, answer the telephone, and greet patients. Along with other office duties, they transcribe dictation and handle the bookkeeping and billing and collection.

Medical assistants also may arrange instruments and equipment in the examining room, check office and laboratory supplies, and maintain the waiting, consulting, and examination rooms in a neat and orderly condition.

Places of Employment

More than 220,000 people, most of them women, worked as medical assistants in 1974. Most worked in the offices of physicians in private practice. Others worked in hospitals and medical clinics.

Training, Other Qualifications, and Advancement

Most medical assistants receive their training on the job. However, a growing number are trained in programs offered in vocational institutes and junior colleges. Other medical assistants learn their skills in adult education courses provided by postsecondary schools.

Applicants for on-the-job or postsecondary school training usually need a high school education or the equivalent. High school courses in mathematics, health, biology, typing, bookkeeping, and office practices are helpful.

Most junior college programs last 2 years and lead to an associate degree; the others are 1-year programs or the equivalent, and graduates receive a diploma. Currently there are 88 programs approved by the Council on Medical Education of the American Medical Association (AMA). The curriculum in these programs consists of courses in biology, anatomy and physiology, typing, transcription, accounting, and medical terminology. Students also receive supervised clinical experience and learn laboratory techniques, use of medical machines, administrative and clinical procedures, and office practices.

The American Association of Medical Assistants (AAMA) sponsors a certification program and its certifying board awards certificates to medical assistants who pass a comprehensive written examination, have at least a high school education or its equivalent, and 2 years of experience in the field. Certification is not a license and is not required for AAMA membership; however, physicians usually consider Certified Medical Assistants (CMA's) to be highly qualified assistants.

The American Medical Technologists register medical assistants who pass a written examination and have completed a 9- to 12-month course from an accredited school. Currently over 60 schools are accredited by the Accrediting Bureau of Medical Laboratory Schools. The Registered Medical Assistant (RMA)

is recognized as competent in the field.

Persons who want to become medical assistants should get along well with people. They also should be thorough, accurate, dependable, and conscientious.

Not every 4-year college will accept all junior college credits. Therefore, students who plan to continue their education should attend a junior college whose credits are accepted by the 4-year college they hope to attend.

Employment Outlook

Employment opportunities for medical assistants, particularly for graduates of accredited junior college programs, are expected to be excellent through the mid-1980's.

Employment of medical assistants is expected to grow faster than the average for all occupations because of the projected rapid increase in the number of physicians in patient care. The growing complexity of medical services, combined with the increasing volume of paper work, also will contribute to the demand for medical assistants.

The need for more medical assistants also is related to the demand for medical care services in general. Generating this demand is a growing population with an increasing proportion of older people who require more medical attention, and expansion in coverage under prepaid insurance programs, including Medicare and Medicaid, that enable more people to afford hospital and medical care.

In addition to openings resulting from growth of the occupation, many jobs will become available each year because of the need to replace workers who die, retire, or leave the occupation for other reasons.

Earnings and Working Conditions

In 1974, weekly salaries generally ranged from $100 to $140 for inexperienced medical assistants, and from $140 to $180 for experienced assistants, according to the limited information available. The salaries of beginners depend on their training and other qualifications. Workers with post-high school training generally receive higher starting salaries than those without any training.

Medical assistants usually work a 40-hour week. Their hours, however, may be irregular. They may work evenings and on Saturdays for equivalent time off during weekdays.

Sources of Additional Information

General information on a career as a medical assistant and on the certification program is available from:

American Association of Medical Assistants, One East Wacker Dr., Suite 1510, Chicago, Ill. 60601.

A list of accredited private schools and information on the registration program are available from:

American Medical Technologists, 710 Higgins Rd., Park Ridge, Ill. 60068.

For information on training programs for medical assistants, contact:

American Medical Association Council on Medical Education, 535 North Dearborn St., Chicago, Ill. 60610.

MEDICAL LABORATORY WORKERS

(D.O.T. 078.128, .168, .281, and .381)

Nature of the Work

Laboratory tests play an important part in the detection, diagnosis, and treatment of many diseases. Medical laboratory workers, often called clinical laboratory workers, include three levels: medical technologists, technicians, and assistants. They perform tests under the direction of pathologists (physicians who diagnose the causes and nature of disease) and other physicians, or scientists who specialize in clinical chemistry, microbiology, or the other biological sciences. Medical laboratory workers analyze the blood, tissues, and fluids in the human body by using precision instruments such as microscopes and automatic analyzers.

Medical technologists, who require 4 years of postsecondary training, perform complicated chemical, microscopic, and bacteriological tests. These tests may include chemical tests to determine, for example, the blood cholesterol level, or microscopic examination of the blood to detect the presence of diseases such as leukemia. Technologists microscopically examine other body fluids; make cultures of body fluid or tissue samples to determine the presence of bacteria, parasites, or other micro-organisms; and analyze the samples for chemical content or reaction. They also may type and cross-match blood samples.

Technologists in small laboratories often perform many types of tests. Those in large laboratories usually specialize in areas such as microbiology, parasitology, biochemistry, blood banking, hematology (the study of blood cells), and nuclear medical technology (the use of radioactive isotopes to help detect diseases).

Most medical technologists conduct tests related to the examination and treatment of patients and may be called on to display independent judgment. Some do research, develop laboratory techniques, teach, or perform administrative duties.

Medical laboratory technicians, who generally require 2 years of postsecondary training, perform a wide range of tests and laboratory procedures that require a high level of skill but not the technical

knowledge of the highly trained technologists. Like technologists, they may work in several areas or specialize in one field.

Medical laboratory assistants, who generally have a year or less of formal training, assist medical technologists and technicians in routine tests and related work that can be learned in a relatively short time. In large laboratories, they may concentrate in one area of work. For example, they may identify slides with abnormal blood cells. In addition to performing routine tests, assistants may store and label plasma; clean and sterilize laboratory equipment, glassware, and instruments; prepare solutions following standard laboratory formulas and procedures; keep records of tests; and identify specimens.

Places of Employment

About 175,000 people worked as medical laboratory workers in 1974. About 80 percent of all medical laboratory workers were women; however, the number of men in the field has been increasing in recent years.

Most medical laboratory personnel work in hospitals. Others work in independent laboratories, physicians' offices, clinics, public health agencies, pharmaceutical firms, and research institutions. These places are concentrated in larger cities and populous States.

In 1974, Veterans Administration hospitals and laboratories employed about 1,900 medical technologists and about 1,900 medical laboratory technicians and assistants. Others worked for the Armed Forces and the U.S. Public Health Service.

Training, Other Qualifications, and Advancement

The minimum educational requirement for a beginning job as a medical technologist usually is 4 years of college training including completion of a specialized training program in medical technology.

Undergraduate work includes courses in chemistry, biological science, and mathematics. These studies give the technologist a broad understanding of the scientific principles underlying laboratory work. Specialized training usually requires 12 months of study and includes extensive laboratory work. In 1974, about 730 hospitals and schools offered programs approved by the American Medical Association. These programs were affiliated with colleges and universities; a bachelor's degree is usually awarded upon completion. A few schools require a bachelor's degree for entry into the program.

Many universities also offer advanced degrees in medical technology and related subjects for technologists who plan to specialize in laboratory work or in teaching, administration, or research.

Medical laboratory technicians employed in 1974 got their training in a variety of educational settings. Many attended junior or 4-year colleges and universities for 1 year or more. Others were trained in the Armed Forces. Some technicians received training in private and nonprofit vocational and technical schools.

Most medical laboratory assistants employed in 1974 were trained on the job. In recent years, however, an increasing number have studied in 1-year training programs conducted by hospitals, junior colleges in cooperation with hospitals, or vocational schools. Hospitals offer the greatest number of training programs. Applicants to these programs should be high school graduates with courses in science and mathematics. The programs include classroom instruction and practical training in the laboratory. They often begin with a general orientation to the clinical laboratory followed by courses in bacteriology, serology, parasitology, hematology, clinical chemistry, blood banking, and urinalysis.

Certification or registration is considered important in this field because it indicates that the persons certified have met educational standards recognized by the certifying body. After the successful completion of the appropriate examinations, medical technologists may be certified as Medical Technologists, MT (ASCP), by the Board of Registry of the American Society of Clinical Pathologists; Medical Technologists, MT, by the American Medical Technologists; or Registered Medical Technologists, RMT, by the International Society of Clinical Laboratory Technology. These organizations also certify technician-level workers. Laboratory assistants are certified by the American Society of Clinical Pathologists.

Medical technologists and technicians must be licensed in Alabama, California, Florida, Georgia, Hawaii, Illinois, Nevada, Pennsylvania, Tennessee, New York City, and Puerto Rico. Requirements for licensure include

a written examination in some States.

Accuracy, dependability, and the ability to work under pressure are important personal characteristics for a medical laboratory worker. Manual dexterity and normal color vision are highly desirable.

Persons interested in medical laboratory careers should use considerable care in selecting a training program. They should get information about the kinds of jobs obtained by graduates, educational costs, the accreditation of the school, the length of time the training program has been in operation, instructional facilities, and faculty qualifications.

Technologists may advance to supervisory positions in certain areas of laboratory work, or, after several years' experience, to chief medical technologist in a large hospital. Graduate education in one of the biological sciences or chemistry usually speeds advancement. Technicians can advance to technologists by getting additional education and experience.

Employment Outlook

Employment of medical laboratory workers is expected to expand faster than the average for all occupations through the mid-1980's, as physicians make wider use of laboratory tests in routine physical checkups and in the diagnosis and treatment of disease. Indirectly influencing growth in the field are population growth, greater health consciousness, and expansion of prepayment programs for medical care that make it easier for people to pay for services.

The use of automated laboratory test equipment is expected to lead to an increase in the number of medical laboratory technicians and assistants relative to technologists. Through technological advances, technicians and assistants can operate equipment to perform tests which previously required the skill of a technologist.

Technologists will be needed to fill supervisory positions in all laboratories. Also, some will be needed in laboratories where they are required by State licensing authorities or third party health insurance regulations, and in laboratories not using the new automated equipment.

Despite an anticipated strong demand for medical laboratory workers through the mid-1980's, the number seeking to enter the field is expected to exceed the number of openings from growth and replacement needs. Consequently, jobseekers in this field may face competition for positions of their choice.

Earnings and Working Conditions

Salaries of medical laboratory workers vary by employer and geographic location. In general, medical laboratory workers employed on the west coast and in large cities received the highest salaries.

Starting salaries for medical technologists in hospitals and medical centers averaged about $9,200 in 1974, according to a survey conducted by the University of Texas Medical Branch. Beginning salaries for laboratory assistants averaged about $6,900. Technicians earn salaries that range between those paid technologists and assistants.

The Federal Government paid newly graduated medical technologists with bachelor's degrees starting salaries of $8,500 a year in late 1974. Those having experience, superior academic achievement, or a year of graduate study entered at $10,520. The Federal Government paid medical laboratory assistants and technicians starting salaries ranging from $5,294 to $8,500 a year in late 1974, depending on the amount and type of education and experience. Medical technologists in the Federal Government averaged $13,300 a year and medical technicians, $11,400 a year, in late 1974.

Medical laboratory personnel generally work a 40-hour week. In hospitals, they can expect some night and weekend duty. Hospitals normally provide vacation and sick leave benefits; some have retirement plans.

Laboratories generally are well-lighted and clean. Although unpleasant odors and specimens of many kinds of diseased tissue often are present, few hazards exist if proper methods of sterilization and handling of specimens, materials, and equipment are used.

Sources of Additional Information

Information about education and training for medical technologists, technicians, and laboratory assistants meeting standards recognized by the American Medical Association, the U.S. Office of Education, or both, as well as career information on these fields of work, is available from:

American Society of Clinical Pathologists, Board of Registry, 2100 W. Harrison St., Chicago, Ill. 60612.

American Society for Medical Technology, 5555 W. Loop South, Bellaire, Tex. 77401.

American Medical Technologists, 710 Higgins Rd., Park Ridge, Ill. 60068.

Accrediting Bureau of Medical Laboratory Schools, Oak Manor Office, 3038 W. Lexington Ave., Elkhart, Indiana 46514.

For information about other technician training programs, contact:

International Society for Clinical Laboratory Technology, 805 Ambassador Building, 411 N. Seventh St., St. Louis, Mo. 63101.

Information about employment opportunities in Veterans Administration hospitals is available from the Office of Personnel (O54E), Veterans Administration, Washington, D.C. 20420.

Information about clinical and research employment opportunities with the National Institutes of Health is available from the Clinical

Center, National Institutes of Health, Bethesda, Maryland 20014.

MEDICAL RECORD TECHNICIANS AND CLERKS

(D.O.T. 249.388)

Nature of the Work

A medical record is a permanent report on a patient's condition and course of treatment in a hospital, clinic, or other health care institution. Doctors, hospital administrators, public health authorities, and insurance companies rely on these records which are kept by important members of the health care staff known as medical record technicians and clerks.

Medical record technicians and clerks perform the essential functions to maintain the medical information system including transcription of medical data, analysis and coding of information, filing, compiling of statistics and abstracting records.

The system used in hospitals to gather, preserve, and maintain the information for the medical records requires the teamwork of many medical record technicians and clerks. In large hospitals, record-keeping activities are supervised and coordinated by a medical record administrator, but in smaller hospitals, experienced medical record technicians often administer the department. In most nursing homes, a medical record clerk, working under the supervision of a medical record consultant who is a Registered Record Administrator (RRA) or an Accredited Record Technician (ART), is responsible for the medical records.

Medical record clerks perform routine clerical tasks that require a minimum of specialized knowledge. They assemble the information for the records in sequence; check to see that all necessary forms, signatures, and dates are present; and locate any previous medical records that may be on file for the patient. They translate selected information such as sex, age, and referral source into a code and enter it on the records. Medical record clerks answer routine staff requests for information about patients and gather statistics for reports to various groups such as State health departments. Some medical record clerks transcribe reports of operations, X-ray and laboratory examinations, and special treatments given to patients.

Medical record clerks follow the explicit instructions and guidelines of their supervisors. Person-to-person contacts in hospitals are limited to providing readily available, nontechnical information to the hospital staff. However, in small nursing homes where the medical record clerk works as the only medical record personnel, there is much personal contact with the patients as well as with fellow staff members.

Beginning medical record technicians perform duties that may be similar to those of clerks but which require more technical knowledge. The technician codes the diseases, operations, and special therapies according to recognized classification systems and enters the codes on the medical record. This coding makes it easier to refer to the record when there is a need to review the patient's case or to collect data for other purposes. Analyzing records and cross-indexing medical information make up a large part of the technician's work. Technicians do the important job of reviewing records for completeness, accuracy, and compliance with requirements, referring incomplete records to the person who compiled them. They review records for internal consistency and point out to their supervisors any apparent errors.

Technicians obtain information from records in answer to legal and insurance company inquiries when authorized to do so by hospital administrators, and gather statistics and prepare periodic reports for hospitals on types of diseases treated, types of surgery performed, and utilization of hospital beds. They also prepare records for microfilming, supervise medical record clerks, assist the medical staff by preparing special studies and tabulating data from records for research, and take records to court.

Places of Employment

In 1974, there were about 10,500 medical record technicians and 43,000 clerks. Although most work in hospitals, a growing number are finding jobs in clinics, nursing homes, community health centers, and health maintenance organizations. Some medical record technicians are consultants to several small health facilities. Some insurance companies employ experienced medical record personnel to collect information from patients' records to determine liability for payment. Public health departments hire medical record technicians to supervise data collection from health care institutions, and to assist in research to improve health

care. Manufacturers of medical record systems, services, and equipment also employ medical record personnel to help develop and market their products.

Most medical record technicians and clerks are women. However, a growing number of men are entering the field.

Training, Other Qualifications, and Advancement

Most employers prefer to fill technician positions with graduates from one of the college or hospital programs which have been accredited by the American Medical Association (AMA) and the American Medical Record Association (AMRA). These range in length from 10-month certificate programs to 2-year associate degree programs. In 1974, there were approximately 60 such programs available. Required courses included biological sciences, medical terminology, medical record science, business management, and secretarial skills. Persons with this training who also have passed the Accredited Record Technician (ART) examination can enter the medical record field as technicians, and can often look forward to promotion to supervisory positions.

High school graduates who have basic secretarial skills can enter the medical record field as beginning clerks. About 1 month of on-the-job training will prepare them for routine tasks that do not require much specialized skill. More training may be necessary for specialized clerical positions such as medical transcriptionists. Although they are not required, high school courses in science, health, typing, mathematics, and office practice are helpful. Medical record personnel must be accurate and pay attention to detail.

The American Medical Record Association offers a correspondence course in medical transcription that can be taken either as a home study program or as in-service training. The certificate given upon the successful completion of the course is helpful in applying for a job as a medical record clerk. Medical terms and references learned provide a good foundation for advancement.

Medical record clerks who have had several years of experience may advance to the technician level through an approved education program, especially in areas where there is a shortage of trained medical record technicians. In addition, another AMRA correspondence course is available for medical record clerks to prepare for the examination for accreditation as medical record technicians. Passing this examination and earning the title of ART often leads to promotion to higher paying and more responsible positions in medical records. In 1974, there were 7,250 ART's.

Employment Outlook

Employment of medical record technicians and clerks is expected to grow much faster than the average for all occupations through the mid-1980's. This employment growth will stem from a continued increase in the use of health insurance, and Medicare and Medicaid, which will result in a need for more complete medical records. New jobs also will be created as nursing homes, clinics, and new types of medical facilities such as health maintenance organizations increasingly employ medical record personnel.

The duties performed by medical record clerks make up most of the work in a medical record department. Thus, the anticipated expansion in medical facilities and recordkeeping offers a very good employment outlook for clerks. However, opportunities for advancement to the technician position without formal courses will greatly decrease.

The outlook for technicians with a 2-year course will be favorable through the mid-1980's. It is expected that medical record technicians will be required to have this specialized training in the future as more attention is given to innovative ideas in medical records as a means of improving medical efficiency and service. As a result, technicians who have not received formal training may experience strong competition for positions from medical record technicians who have an associate degree.

Earning and Working Conditions

Earnings of medical record clerks and technicians vary greatly according to locality. Beginning medical record clerks earned an average of $6,500 annually in nongovernment hospitals in 1974. Earnings ranged from $5,000 in small hospitals in the South to $10,000 in New York City, according to limited data. In general, salaries are highest in the big cities and lowest in rural areas. Salaries usually are higher in larger hospitals.

Salaries of medical record technicians follow a similar geographic pattern. Limited data indicate that in 1974, the median annual salary for ART's was $10,000. Experienced technicians who were directors of hospital medical record departments averaged $10,500. Some earned over $12,000 a year.

In Federal hospitals, medical record clerks earned a beginning annual salary of $6,764 in late 1974. Annual salaries of medical record technicians ranged from $6,764 to $13,679. Outstanding medical record technicians may work up to higher supervisory positions with corresponding pay increases, although most of these positions are filled by Registered Record Administrators.

Like most hospital employees, medical record personnel work a 36-to-40-hour week, receive paid

holidays and vacations, health and insurance benefits, and can participate in retirement plans. Although most of the positions are full time, some part-time jobs are available.

Sources of Additional Information

A list of approved schools for medical record technicians, facts about the correspondence courses for medical transcription and medical record personnel, and additional details on the work performed by medical record technicians are available from:

American Medical Record Association, John Hancock Center, Suite 1850, 875 North Michigan Ave., Chicago, Ill. 60611.

OPERATING ROOM TECHNICIANS

(D.O.T. 079.378)

Nature of the Work

Operating room technicians, occasionally called surgical technicians, assist surgeons and anesthesiologists before, during, and after surgery.

They help set up the operating room with the instruments, equipment, sterile linens, and fluids such as glucose that may be needed during an operation. Operating room technicians also prepare patients for surgery by washing, shaving, and disinfecting the parts of the body where the surgeon will operate. They may transport patients to the operating room and help drape and position them on the operating table.

During surgery, they pass instruments and other sterile supplies to the surgical team. They hold retractors, cut sutures, and help nurses count the sponges, needles, and instruments used during the operation. Operating room technicians help prepare, care for, and dispose of specimens taken for testing during the operation and help apply dressings. They may operate sterilizers, lights, suction machines, and diagnostic equipment.

After the operation, operating room technicians help transfer patients to the recovery room and assist nurses in cleaning and stocking the operating room for the next operation.

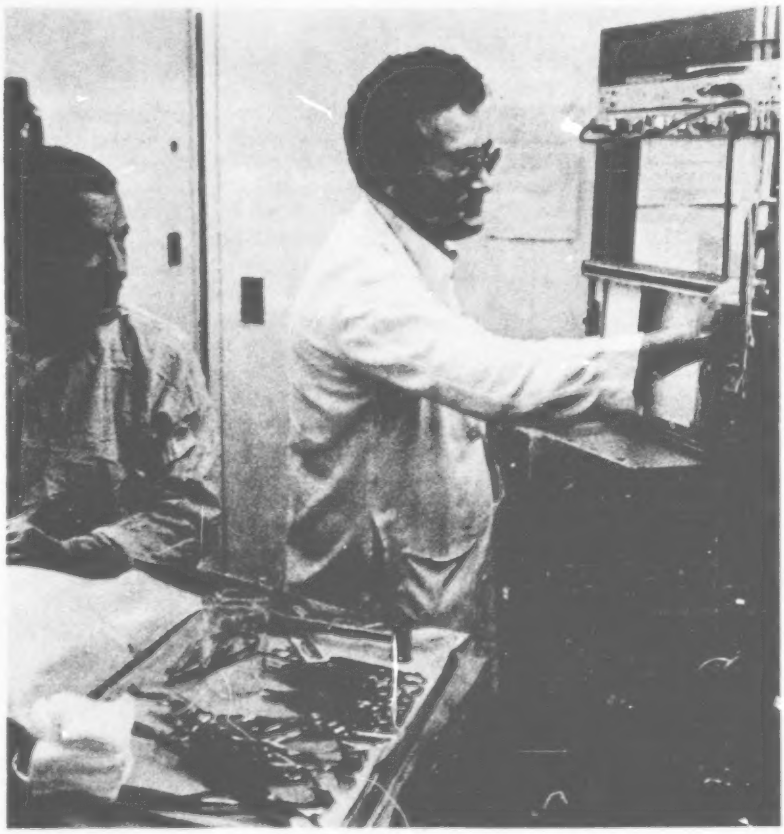
Places of Employment

About 28,000 people, over one-half of them women, worked as operating room technicians in 1974. They worked in hospitals or other institutions that have operating room, delivery room, and emergency room facilities. Many are members of the Armed Forces.

Training and Other Qualifications

Some operating room technicians are trained on the job. A high school education or the equivalent is generally required for entry into training and employment. On-the-job training programs in many hospitals include classroom instruction. The length of these programs varies from 6 weeks to 1 year, depending on the trainee's qualifications and the objectives of the training given. Some hospitals prefer applicants who have worked as nursing aides or practical nurses.

Some operating room technicians are trained in vocational and technical schools and community and junior colleges. Others obtain their training in the Armed Forces. Most of these training programs last



from 9 months to 1 year; some junior college programs last 2 years and lead to an associate degree.

Students in junior colleges and vocational schools get classroom training as well as supervised clinical experience. Required courses include anatomy, physiology, and microbiology. Courses teaching practical applications include the care and safety of patients during surgery, use of anesthesia and its hazards, and nursing procedures. They also learn how to sterilize instruments, prevent and control infection, and handle special drugs, solutions, supplies, and equipment. The same types of courses are taught in hospital-based programs.

The Association of Operating Room Technicians awards a certificate to operating room technicians who pass their comprehensive examination. A Certified Operating Room Technician (CORT) is recognized as competent in the field and is generally paid a higher salary.

Manual dexterity is a necessity for operating room technicians since they must handle various instruments quickly. They must be orderly and emotionally stable. High school students interested in careers in this occupation are advised to take courses in health and biology.

Employment Outlook

Employment opportunities for operating room technicians are expected to be good through the mid-1980's. Graduates of 2-year community and junior college programs should be especially in demand.

Employment in this field is expected to grow faster than the average for all occupations as operating room technicians increasingly assume more of the routine nursing tasks in the operating room. The same factors that contribute to the demand for health workers in general apply to operating room technicians—population growth and the increased ability of people to pay for medical care due to expansion in coverage under prepayment insurance programs.

In addition to job openings resulting from growth of the occupation, many new operating room technicians will be needed to replace workers who die, retire, or leave the field for other reasons.

Earnings and Working Conditions

The average starting salary for operating room technicians was about $6,500 a year in 1974, according to a national survey conducted by the University of Texas Medical Branch. Experienced technicians earned average salaries of approximately $8,100 annually. In late 1974, the Federal Government paid operating room technicians starting salaries of $7,596 a year. Most experienced operating room technicians employed by the Federal Government received annual salaries of $9,473.

Graduates of community and junior colleges often earn higher salaries than workers without formal training. Salaries, reflecting variations in the cost of living, also vary widely by geographic location, with those on the East and West Coasts generally higher. Usually, operating room technicians earn about as much as the average for all nonsupervisory workers in private industry, except farming.

Operating room technicians usually work a 5-day, 40-hour week. However, they may be required to work "on call" shifts (staying available to work on short notice).

Sources of Additional Information

Additional information on a career as an operating room technician and on training programs for the occupation is available from:

Association of Operating Room Technicians, Inc., 1100 West Littleton Blvd., Suite 201, Littleton, Colo. 80120.

OPTOMETRIC ASSISTANTS

Nature of the Work

Optometric assistants perform a wide variety of tasks, allowing optometrists to devote more time to their professional duties. They keep patients' records, schedule appointments, and handle bookkeeping, correspondence, and filing. They prepare patients for eye examinations and help optometrists test for near and distant eyesight, color blindness, and tension of or pressure on the eyeball. Optometric assistants measure patients for correct and comfortable fit of glasses. They suggest size and shape of eyeglass frames to compliment the patient's facial features, and adjust finished eyeglasses by heating, shaping, and bending the plastic or metal frames. They also assist the optometrist in fitting contact lenses and in giving instructions on the use and care of the lenses.

Optometric assistants help patients with exercises for eye coordination to overcome focusing defects in the laboratory. They modify conventional glasses or contact lenses to assure proper fit, insert lenses in frames, repair frames, keep an inventory of optometric materials and clean and care for the instruments.

In a large optometric complex, assistants may specialize in visual training, chairside assistance, or office administration. In a smaller practice, they may perform all these duties.

Places of Employment

About 11,500 persons, most of them women, worked as optometric assistants in 1974. Most worked for optometrists in private practice. Others worked for health clinics, optical instrument manufacturers, or government agencies. Some served as assistants to optometrists in the Armed Forces.

Training, Other Qualifications, and Advancement

Most optometric assistants are trained on the job in their employers' offices. Training also can be acquired in 1-year academic courses; nine schools offered this type of training in 1974. More detailed training in the technical aspects of optometry was available in 17 schools that offered 2-year courses leading to an associate degree.

High school graduation or its equivalent, including courses in mathematics and office procedures, is preferred for on-the-job training or admission to a formal training program. All of the formal programs offer specialized courses such as the anatomy and physiology of the human eye, orthoptics (correction of defective vision), and contact lens theory and practice. Programs also include courses in secretarial and office procedures. Lectures and laboratory work are supplemented by actual experience in optometric clinics and practices.

Although there are relatively few programs for training optometric assistants, a recent study indicated that over 4 optometrists out of 5 feel that a 1- or 2-year course, followed by some on-the-job instruction, is the best preparation. This training will become more important in gaining initial employment and advancement as more programs become available.

Manual dexterity, accuracy, and the ability to distinguish shades of color are requirements for persons planning to become optometric assistants. Because of the person-to-person work relationship between optometric assistants and patients, a neat appearance, courtesy, and tact are important qualifications.

Employment Outlook

The employment of optometric assistants is expected to grow much faster than the average for all occupations through the mid-1980's. Employment opportunities for optometric assistants who have completed one of the formal training programs should be excellent. On-the-job training, however, probably will continue to be the means by which most persons enter the occupation. The availability of many positions which require fewer than 8 hours of work a day offers opportunities for continued employment while caring for a family.

Factors underlying the expected growth of the occupation are the increase in population and greater demand for eye care services. As the number of patients served by optometrists increase, more trained assistants will be needed.

Earnings and Working Conditions

Earnings of optometric assistants vary by geographical region, academic and technical qualifications, and the size and type of practice of the optometrists employing them. In 1974, beginning salaries ranged from $100 a week for optometric assistants having no training or experience to $160 a week for experienced and highly trained assistants, according to limited information available.

Most optometric assistants work between 30 and 40 hours a week, but about 1 out of 10 works shorter hours. Occasionally they may work a few hours on Saturday. The work is not strenuous and physical surroundings are usually pleasant.

Sources of Additional Information

Further information on a career as an optometric assistant and a list of training programs are available from:

American Optometric Association, 7000 Chippewa St., St. Louis, Mo. 63119.

RADIOLOGIC (X-RAY) TECHNOLOGISTS

(D.O.T. 078.168 and .368)

Nature of the Work

Medical X-rays play a major role in the diagnostic and therapeutic fields of medicine. Radiologic technologists, also called medical X-ray technologists, operate X-ray equipment. They are usually supervised by radiologists (physicians who specialize in the use of X-rays).

Most radiologic technologists use X-ray equipment to take pictures of internal parts of the patient's body. They may prepare chemical mixtures, such as barium salts, which the patients swallow to make specific organs appear clearly in X-ray examinations (recorded in radiographs). Technologists use radiation protection devices and techniques to safeguard themselves, as well as patients, against possible radiation hazards. After determining the correct voltage, current, and exposure time, technologists position the patient and make the required number of radiographs to be developed for interpretation by the physician. Technologists may use mobile X-ray equipment at a patient's bedside and in surgery. They also usually keep treatment records.

Some radiologic technologists do radiation therapy work. They help physicians treat patients with diseases, such as certain types of cancer, by administering prescribed doses of X-ray or other forms of radiation to the affected areas of the body. They also may assist radiologists in measuring and handling radium and other radioactive materials.

Other technologists work in the field of nuclear medicine in which radioactive isotopes are used to diagnose and treat diseases. They help the physician prepare and administer the prescribed radioisotope and operate special equipment for tracing and measuring radioactivity.

Places of Employment

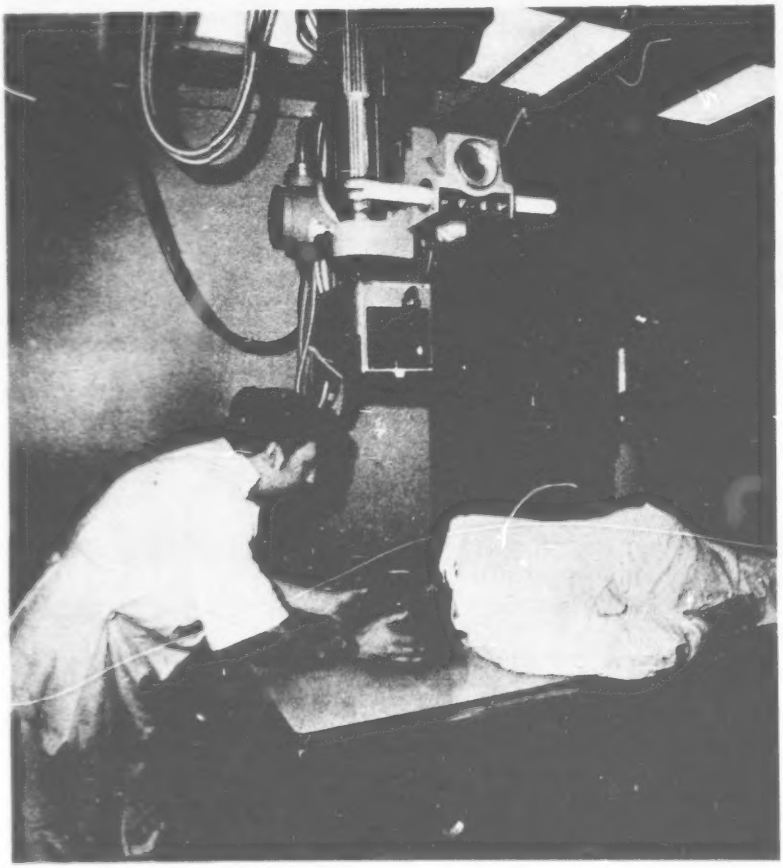
About 82,000 persons—about two-thirds of them women—worked as radiologic technologists in 1974.

Hospitals employ about three-fourths of all radiologic technologists; most of the remainder work in medical laboratories, physicians' and dentists' offices or clinics, Federal and State health agencies, and public school systems.

Training, Other Qualifications, and Advancement

The requirement for entry into this field is the completion of a formal training program in X-ray technology. In 1974, about 1,200 programs in X-ray technology offered in hospitals, medical schools affiliated with hospitals, colleges, and community colleges were approved by the American Medical Association (AMA).

Training also may be obtained in the military service, or through



courses in X-ray technology offered by vocational or technical schools. Programs vary in length from 24 months to 3 or 4 years. In addition, about 42 schools award a bachelor's degree in radiologic technology. While employers generally pay graduates of bachelor's degree programs the same starting salaries as those of 2- and 3-year programs, there is more potential for promotion for these holding the baccalaureate degree. It is advantageous for those planning to be teachers or administrators in this field to pursue the bachelor's and master's degrees as preparation.

All schools accept only high school graduates. Courses in mathematics, physics, chemistry, biology, and typing are helpful.

X-ray technology programs include courses in anatomy, physiology, nursing procedures, physics, radiation protection, darkroom chemistry, principles of radiographic exposure, X-ray therapy, radiographic positioning, medical ethics, department administration, and the operation and maintenance of equipment.

Registration with the American Registry of Radiologic Technologists is an asset in obtaining highly skilled and specialized positions. Registration requirements include graduation from an approved school of medical X-ray technology and the satisfactory completion of a written examination. After registration, the title "Registered Technologist (ARRT)" may be used. Once registered, technologists may be certified in radiation therapy or nuclear medicine by completing an additional year of combined classroom study and work experience.

Good health and stamina are important qualifications for this field.

As openings occur, some technologists in large X-ray departments may qualify as instructors in X-ray techniques or advance to chief X-ray technologists.

Employment Outlook

Employment in the field of radiologic technology is expected to expand faster than the average for all occupations through the mid-1980's as X-ray equipment is increasingly used to diagnose and treat diseases. The demand for radiologic technologists also will increase as prepaid medical programs extend medical care to wider segments of the population. Part-time workers will find the best opportunities in physicians' offices and clinics where full-time radiologic services usually are not required.

Although the demand for radiologic technologists should continue to be strong, the number of graduates of AMA-approved programs in this field also is expected to grow rapidly during the period. If present enrollment patterns continue, the number seeking to enter the occupation is likely to exceed the number of openings from growth and replacement needs. As a result, graduates may face competition for positions of their choice.

Earnings and Working Conditions

Starting salaries of radiologic technologists employed in hospitals and medical centers averaged about $7,800 a year in 1974, according to a national survey conducted by the University of Texas Medical Branch. Experienced radiologic technologists averaged $9,600 a year, or slightly more than the average for all nonsupervisory workers in private industry, except farming.

The Federal Government paid new graduates of AMA-approved schools of X-ray technology starting salaries of $7,596 a year in late 1974.

Full-time technologists generally work 8 hours a day and 40 hours a week but may be "on call" for some weekend or night emergency duty. Sick leave, vacations, insurance, and other benefits are comparable to those covering other workers in the same organization.

There are potential radiation hazards in this field; however, these hazards have been greatly reduced by the use of safety devices such as instruments that measure radiation exposure, lead aprons, gloves, and other shieldings.

Sources of Additional Information

For additional information about programs and careers in radiologic technology, write:

The American Society of Radiologic Technologists, 500 North Michigan Ave., Suite 836, Chicago, Ill. 60611.

The American Registry of Radiologic Technologists, 2600 Wayzata Blvd., Minneapolis, Minn. 55405.

RESPIRATORY THERAPY WORKERS

(D.O.T. 079.368)

Nature of the Work

Respiratory therapy workers, sometimes called inhalation therapy workers, treat patients with cardiorespiratory problems. This treatment may range from giving temporary relief to patients with chronic asthma or emphysema to giving emergency care in cases of heart failure, stroke, drowning, and shock. Respiratory therapy workers also are among the first medical specialists called for emergency treatment of acute respiratory conditions arising from head injury or drug poisoning. Since a patient can safely cease to breathe for only a short span of time, the therapy worker has a highly responsible role. If breathing has stopped for longer than 3 to 5 minutes, there is little chance that the patient can recover without brain damage, and if oxygen is unavailable for more than 9 minutes, death results.

Respiratory therapy workers follow doctors' orders and use special equipment such as respirators and positive-pressure breathing machines to administer gas therapy, aerosol therapy, and other treatments involving respiration. They also show patients and their families how to use the equipment at home. Other duties include keeping records of the cost of materials and charges to patients, and maintaining and making minor repairs to equipment.

There are three levels of workers within the field of respiratory therapy: therapists, technicians, and assistants. Therapists and technicians perform essentially the same duties. However, the therapist is expected to have a higher level of expertise and may be expected to assume some teaching and supervisory duties. Respiratory therapy assistants have little contact with patients and spend most of their time taking care of the equipment. Many are new to the job and are training to advance to the technician or therapist level.

Places of Employment

About 38,000 persons worked as respiratory therapists, technicians, or assistants in 1974—about one-half were women.

Most work in hospitals, in respiratory therapy, anesthesiology, or pulmonary medicine departments. Others work for oxygen equipment rental companies, ambulance services, nursing homes, and universities.

Training, Other Qualifications, and Advancement

Respiratory apparatus has become increasingly complex in recent years and, although a few respiratory therapy workers are trained on the job, formal training is now stressed as the requisite for entry to the field.

In 1974, about 125 institutions offered educational programs in respiratory therapy approved by the Council on Medical Education of the American Medical Association. High school graduation is required for entry. Courses vary in length between 18 months and 4 years and include both theory and clinical work. A bachelor's degree is awarded for completion of a 4-year program and lesser degrees are awarded for shorter courses. Areas of study include human anatomy and physiology, chemistry, physics, microbiology, and mathematics. Technical courses offered deal with procedures, equipment, and clinical tests.

Respiratory therapists who have a certificate of graduation from an AMA-approved therapist training program, 62 semester hours of college credit, and 1 year of experience following completion of the program are eligible to apply for registration by the National Board for Respiratory Therapy (NBRT). The registry examination consists of two tests, a written and an oral. Applicants must pass both to be awarded the American Registered Respiratory Therapist (ARRT) credential. In 1974, about 2,500 therapists had been registered. A registered respiratory therapist often can advance faster and obtain a more responsible position than one who is not registered. An increasing number of employers recognize registration as an acknowledgment of a therapist's professional competence.

Individuals who complete an AMA-approved technician training program and have 1 year of experience in respiratory therapy may apply to the NBRT for examination for the Certified Respiratory Therapy Technician (CRTT) cre-

dential. The CRTT examination is less comprehensive than the registry examination and consists of a single written test. Approximately 8,000 respiratory therapy technicians had been certified in 1974.

In contrast to therapists and technicians, there are no general requirements for the position of respiratory therapy assistant. The only requirements are those set by the head of the hospital department that is hiring workers. For example, some require a high school diploma.

Respiratory therapists can advance to positions as assistant chief, chief therapist, or, with graduate education, instructor of respiratory therapy at the college level. Respiratory therapy technicians and assistants can advance to the therapist level by taking the appropriate training courses.

People who want to enter the respiratory therapy field should enjoy working with patients and should understand their physical and psychological needs. Respiratory therapy workers must be able to pay attention to detail, follow instructions, and work as part of a team. Operating the complicated respiratory therapy equipment also requires mechanical ability and manual dexterity. High school students interested in a career in this field are encouraged to take courses in health, biology, mathematics, physics, and bookkeeping.

Employment Outlook

Employment opportunities for respiratory therapy workers are expected to be good through the mid-1980's. Those with advanced training in respiratory therapy will be in demand to fill teaching and supervisory positions.

The employment of respiratory therapy workers is expected to grow much faster than the average for all occupations, owing to new uses for respiratory therapy, increased acceptance of its use, and the growth in health services in general. Many specialists in respiratory therapy will be hired to release nurses and other personnel from respiratory therapy work to return to their primary duties. Many other openings will arise from the need to replace those who retire, die, or leave the occupation for other reasons.

Earnings and Working Conditions

The starting salary of respiratory therapists employed in hospitals and medical centers averaged about $8,064 a year in 1974, according to a survey conducted by the University of Texas Medical Branch. Top salaries of experienced respiratory therapists in hospitals ranged as high as $13,980 a year. Salaries of respiratory therapy technicians and assistants are lower than those of respiratory therapists.

The Federal Government paid respiratory therapists starting salaries of $6,764 a year in late 1974 if they had 1 year of post-secondary training, and $7,596 for those with 2 years of training. Some therapists employed by the Federal Government in late 1974 earned as much as $13,679 a year.

Respiratory therapy workers in hospitals receive the same benefits as other hospital personnel, including hospitalization, paid vacations, and sick leave. Some institutions provide tuition assistance or free courses, pension programs, uniforms, and parking.

Respiratory therapy workers generally have a 40-hour week. After-hours and weekend duty is generally required since most hospitals have 24-hour coverage throughout the week. Adherence to safety precautions and regular testing of equipment minimize the potential hazard of fire to workers and patients.

Sources of Additional Information

Information concerning education programs is available from:

American Association for Respiratory Therapy, 7411 Hines Place, Dallas, Tex. 75235.

Information on the accrediting of respiratory therapists and respiratory therapy technicians can be obtained from:

The National Board for Respiratory Therapy, Inc., 1900 West 47th St., Suite 124, Westwood, Kansas 66205.

On-the-job training information can be obtained at local hospitals.

NURSING OCCUPATIONS

The nursing field, consisting of registered nurses; licensed practical nurses; and nursing aides, orderlies, and attendants, accounts for about one-half of total employment among health service workers. Nursing personnel perform a variety of duties to care for and comfort the sick, the injured, and others requiring medical services.

This section deals in detail with the three basic nursing occupations.

Registered nurses (*RN's*) follow doctors' orders, dispense medications and treatments, and observe and monitor patients' progress. Some become head nurses and are in charge of all nursing services of a specified area of an institution; for example, a pediatrics ward.

Licensed practical nurses provide skilled nursing care to sick, injured, and convalescent patients. They work under the general supervision of physicians and registered nurses, and may sometimes supervise nursing aides, orderlies, and attendants.

Nursing aides, orderlies, and attendants make up the largest group of nursing personnel. They serve meals, feed patients, and do other tasks that free professional and practical nurses for work requiring professional and technical training.

Those seeking to be registered nurses, licensed practical nurses, and nursing aides, orderlies, and attendants should like working with people, since they must work closely with other members of the health team and care for patients who are uncomfortable and sometimes irritable. Nursing workers must be reliable and possess a level head in emergencies.

REGISTERED NURSES

(D.O.T. 075.118 through .378)

Nature of the Work

Nursing plays a major role in health care. As important members of the medical care team, registered nurses perform a wide variety of functions. They observe, evaluate, and record symptoms, reactions, and progress of patients; administer medications; assist in the rehabilitation of patients; and help maintain a physical and emotional environment that promotes recovery.

Some registered nurses provide hospital care. Others perform research activities or instruct students. The setting usually determines the scope of the nurse's responsibilities.

Hospital nurses constitute the largest group of nurses. Most are staff nurses who provide skilled bedside nursing care and carry out the medical treatment plans prescribed by physicians. They may also supervise practical nurses, aides, and orderlies. Hospital nurses usually work with groups of patients that require similar nursing care. For instance, some nurses work with patients who have had surgery; others care for children, the elderly, or the mentally ill. Some are administrators of nursing services.

Private duty nurses give individual care to patients who need constant attention. The private duty nurse may sometimes care for several hospital patients who require special care, but not full-time attention.

Office nurses assist physicians, dental surgeons, and occasionally dentists in private practice or clinics. Sometimes they perform routine laboratory and office work in addition to their nursing duties.

Public health nurses care for patients in clinics, homes, schools, and other community settings. They instruct patients and families in proper care and give periodic care as prescribed by a physician. They may also instruct groups of patients in proper diet and arrange for immunizations. These nurses work with community leaders, teachers, parents, and physicians in community health education. Some public health nurses work in schools.

Nurse educators teach students the principles and skills of nursing, both in the classroom and in direct patient care. They also conduct continuing education courses for registered nurses, practical nurses, and nursing assistants.

Occupational health or industrial nurses provide nursing care to employees in industry and government and, along with physicians promote employee health. As prescribed by a doctor, they treat minor injuries and illnesses occurring at the place of employment, provide for the needed nursing care, arrange for further medical care if necessary, and offer health counseling. They also may assist with health examinations and inoculations.

(Licensed practical nurses who also perform nursing services are discussed elsewhere in the *Handbook.*)

Places of Employment

Nearly 860,000 persons—all but 1 percent of them women—worked as registered nurses in 1974. About one-third worked on a part-time basis.

About three-quarters of all registered nurses worked in hospitals, nursing homes, and related institutions. About 50,000 were office nurses and about 40,000 were private duty nurses who cared for patients in hospitals and private homes. Public health nurses in government agencies, schools, visiting nurse associations, and clinics numbered about 55,000; nurse educators in nursing schools accounted for about 30,000; and occupational health nurses in industry, about 20,000. Most of the others were staff members of professional nurse and other organizations, State boards of nursing, or working for research organizations.

Training, Other Qualifications, and Advancement

A license is required to practice professional nursing in all States and in the District of Columbia. To obtain a license, a nurse must be a graduate of a school approved by the State board of nursing and pass the State board examination. Nurses may be licensed in more than one State, either by examination or endorsement of a license issued by another State.

Three types of educational programs—diploma, baccalaureate, and associate degree—offer the education required for basic careers in registered nursing. All three programs prepare candidates for licensure; however, the baccalaureate program is preferred for those who aspire to administrative or management positions, and those planning to work in research, consultation, teaching, or clinical specialization, which require education at the master's level. Graduation from high school is required for admission to all schools of nursing.

Diploma programs are conducted by hospital and independent schools and usually require 3 years of training. Bachelor's degree programs usually require 4 years of study in a college or university, although a few require 5 years. Associate degree programs in junior and community colleges require approximately 2 years of nursing education. In addition, several programs provide licensed practical nurses with the training necessary to upgrade themselves to registered nurses while they continue to work part time. These programs generally offer an associate of arts degree. In early 1974, about 1,430 programs (associate, diploma, and baccalaureate) were offered in the United States. In addition, there were 94 master's and doctoral degree programs in nursing.

Programs of nursing include classroom instruction and supervised nursing practice in hospitals and health facilities. Students take courses in anatomy, physiology, microbiology, nutrition, psychology, and nursing. They also get supervised clinical experience in the care of patients who have different types of health problems. Students in bachelor's degree programs as well as in some of the other programs are assigned to community agencies to learn how to care for patients in clinics and in the patients' homes. General education is combined with nursing education in baccalaureate and associate degree programs and in some diploma programs.

Qualified students who need financial aid may be able to get a federally sponsored nursing scholarship or a low-interest loan.

Young persons who want to pursue a nursing career should have a sincere desire to serve humanity and be sympathetic to the needs of others. Nurses must be able to follow orders precisely and to use good judgment in emergencies; they also should be able to accept responsibility and direct or supervise the activity of others. Good mental health is needed in order to cope with human suffering and frequent emergency situations. Staff nurses need physical stamina because of the amount of time spent walking and standing.

From staff positions in hospitals, experienced nurses may advance to head nurse, assistant director, and director of nursing services. A master's degree, however, often is

required for supervisory and administrative positions, as well as for positions in nursing education, clinical specialization, and research. In public health agencies, advancement is usually difficult for nurses who do not have degrees in public health nursing.

A growing movement in nursing, generally referred to as the "nurse practitioner program" is opening new career possibilities. Nurses who wish to take the extra training are preparing for highly independent roles in the clinical care and teaching of patients. They are practicing in primary roles which include pediatrics, geriatrics, community health, mental health, and medical-surgical nursing.

Employment Outlook

Employment opportunities for registered nurses are expected to be favorable through the mid-1980's. However,if trends in the number of persons enrolling in schools of nursing continue, some competition for more desirable, higher paying jobs may develop during the latter part of this period. Opportunities for full- or part-time work in present shortage areas such as some southern States and many inner-city locations are expected to be very favorable through 1985. For nurses who have had graduate education, the outlook is excellent for obtaining positions as administrators, teachers, clinical specialists, and public health nurses.

Growth in employment of registered nurses is expected to be much faster than the average for all occupations because of extension of prepayment programs for hospitalization and medical care, expansion of medical services as a result of new medical techniques and drugs, and increased interest in preventive medicine and rehabilitation of the handicapped. In addition to the need to fill new positions, large numbers of nurses will be required to replace those who leave the field each year.

Earnings and Working Conditions

Registered nurses who worked in hospitals in 1974 received average starting salaries of $9,100 a year, according to a national survey conducted by the University of Texas Medical Branch. This was above the average for nonsupervisory workers in private industry, except farming. Registered nurses in nursing homes can expect to earn slightly less than those in hospitals. Salaries of industrial nurses averaged $192 a week in early 1974, according to a survey conducted by the Bureau of Labor Statistics.

In early 1975, the Veterans Administration paid inexperienced nurses who had a diploma or an associate degree starting salaries of $9,473 a year; those with baccalaureate degrees, $11,070. Nurses employed in all Federal Government agencies earned an average of $14,700 in 1974.

Most hospital and nursing home nurses receive extra pay for work on evening or night shifts. Nearly all receive from 5 to 13 paid holidays a year, at least 2 weeks of paid vacation after 1 year of service, and also some type of health and retirement benefits.

Sources of Additional Information

For information on approved schools of nursing, nursing careers, loans, scholarships, salaries, working conditions, and employment opportunities, contact:

ANA Committee on Nursing Careers, American Nurses' Association, 2420 Pershing Rd., Kansas City, Mo. 64108.

Information about employment opportunities in the Veterans Administration is available from:

Department of Medicine and Surgery, Veterans Administration, Washington, D.C. 20420.

LICENSED PRACTICAL NURSES

(D.O.T. 079.378)

Nature of the Work

Licensed practical nurses' help care for the physically or mentally ill and infirm. Under the direction of physicians and registered nurses, they provide nursing care that requires technical knowledge but not the professional training of a registered nurse. (See statement on Registered Nurses.) In California and Texas, licensed practical nurses are called *licensed vocational nurses*.

In hospitals, licensed practical nurses provide much of the bedside care needed by patients. They take and record temperatures and blood pressures, change dressings, administer certain prescribed medicines, and help bed patients with bathing and other personal hygiene. They assist physicians and registered nurses in examining patients and in carrying out nursing procedures. They also assist in the delivery, care, and feeding of infants, and help registered nurses in recovery rooms by reporting any adverse changes in patients. Some licensed practical nurses help supervise hospital attendants. (See statement on Nursing Aides, Orderlies, and Attendants.)

Licensed practical nurses who work in private homes provide mainly day-to-day patient care that seldom involves highly technical procedures or complicated equipment. In addition to providing nursing care, they may prepare meals and care for the patient's comfort and morale. They also teach family members how to perform simple nursing tasks.

In doctors' offices and in clinics, licensed practical nurses prepare patients for examination and treatment. They also may make appointments and record information about patients.

Places of Employment

About 495,000 persons—the great majority of them women—worked as licensed practical nurses in 1974. Hospitals employed about three-fifths of all licensed practical nurses. Most of the others worked in nursing homes, clinics, doctors' offices, sanitariums, and other long-term care facilities. Many worked for public health agencies and welfare and religious organizations. Some self-employed nurses worked in hospitals or the homes of their patients.

Training, Other Qualifications, and Advancement

All States and the District of Columbia regulate the preparation and licensing of practical nurses. To be licensed, students must complete a course of instruction in practical nursing that has been approved by the State board of nursing and pass an examination. Educational requirements for enrollment in State-approved training programs range from completion of eighth or ninth grade to high school graduation. Many schools do not require completion of high school but they give preference to graduates. Physical examinations and aptitude tests are usually required.

In 1974, over 1,300 State-approved programs provided practical nursing training. Public schools offered more than half of these programs as part of their vocational and adult education programs. Other programs were available at junior colleges, local hospitals, health agencies, and private educational institutions.

Practical nurse training programs are generally 1 year long and include both classroom study and clinical practice. Classroom instruction covers nursing concepts and principles and related subjects including anatomy, physiology, medical-surgical nursing, administration of drugs, nutrition, first aid, and community health. Students learn to apply their skill to an actual nursing situation through supervised hospital work.

Aspiring licensed practical nurses should have a deep concern for human welfare. They must be emotionally stable because working with sick and injured people sometimes can be upsetting.

As part of a health care team, they must be able to follow orders and work under close supervision. Good health is very important, as is the physical stamina needed to work while standing a great deal.

Advancement opportunities are limited without additional training. In-service educational programs prepare some licensed practical nurses for work in specialized areas, such as post-surgery recovery rooms, or intensive care units. Under career ladder programs, nurses' aides attend training to become licensed practical nurses (LPN's) while continuing to work part time. Similarly, in some cases, LPN's may prepare to become registered nurses while they continue to work part time.

Employment Outlook

The employment outlook for licensed practical nurses is expected to be very good through the mid-1980's. Employment is expected to continue to rise much faster than the average for all occupations through the mid-1980's in response to the needs of a growing population and expanded public and private health insurance plans. Jobs will be created also as licensed practical nurses take over duties previously performed by registered nurses. Also, thousands of newly licensed practical nurses will be needed each year to replace those who die, retire or leave the occupation for other reasons.

Earnings and Working Conditions

The average starting salary of licensed practical nurses in hospitals was about $6,700 a year in 1974, according to a national survey conducted by the University of Texas Medical Branch.

Federal hospitals offered beginning licensed practical nurses an annual salary of $6,764 in 1974.

Many hospitals give pay increases after specific periods of satisfactory service. Some provide free lodging and laundering of uniforms. Practical nurses generally work 40 hours a week, but often this workweek includes some work at night and on weekends and holidays. Many hospitals provide paid holidays and vacations, health insurance, and pension plans.

In private homes, licensed practical nurses usually work 8 to 12 hours a day and go home at night.

Sources of Additional Information

A list of State-approved training programs and information about practical nursing is available from:

ANA Committee on Nursing Careers, American Nurses' Association, 2420 Pershing Rd., Kansas City, Mo. 64108.

National Association for Practical Nurse Education and Service, Inc., 122 East 42d St., Suite 800, New York, N.Y. 10017.

National Federation of Licensed Practical Nurses, Inc., 250 West 57th St., New York, N.Y. 10019.

Information about employment opportunities in U.S. Veterans Administration hospitals is available from your local Veterans Administration hospital, as well as:

Department of Medicine and Surgery, Veterans Administration, Washington, D.C. 20420.

NURSING AIDES, ORDERLIES, AND ATTENDANTS

(D.O.T. 355.687 through 355.887)

Nature of the Work

Nursing aides, orderlies, and attendants perform a variety of duties to care for sick and injured people. Other job titles include *hospital attendant, nursing assistant, auxiliary nursing worker, home health aide, geriatric aide*, and (in mental institutions) *psychiatric aide*.

Nursing aides and orderlies answer patients' bell calls and deliver messages, serve meals, feed patients who are unable to feed themselves, make beds, and bathe and dress patients. They also may give massages, take temperatures, and assist patients in getting out of bed and walking. Orderlies provide many of the same services. Orderlies also escort patients to operating and examining rooms and transport and set up heavy equipment. Some attendants may work in hospital pharmacies or supply rooms.

The duties of nursing aides depend on the policies of the institutions where they work, the type of patient being cared for, and—equally important—the capacities and resourcefulness of the nursing aide or orderly. In some hospitals, they may clean patients' rooms and do other household tasks. In others, under the supervision of registered nurses and licensed practical nurses, they may assist in the care of patients. The tasks performed for patients differ considerably, and depend on whether the patient is confined to bed following major surgery, is recovering after a disabling accident or illness, or needs assistance with daily activities because of infirmity caused by advanced age.

Places of Employment

About 970,000 persons worked as nursing aides, orderlies, and attendants in 1974; more than four-fifths were women. Most of them work in hospitals. Others work primarily in nursing homes and other institutions that provide facilities for care and recuperation. A small number give supportive services to patients in their homes.

Training, Other Qualifications, and Advancement

Although some employers prefer high school graduates, many, such as Veterans Administration hospitals, do not require a high school diploma. Many employers accept applicants 17 or 18 years of age. Others—particularly nursing homes and mental hospitals—prefer to hire more mature persons who are at least in their mid-twenties.

Nursing aides generally are trained after they are hired. Some institutions combine on-the-job training, under the close supervision of registered or licensed practical nurses, with classroom instruction. Students learn to take and record temperatures, bathe patients, change linens on beds that are occupied by patients, and move and lift patients. Training may last several days or a few months, depending on the policies of the hospital, the complexity of the du-

ties, and the aide's aptitude for the work.

Courses in home nursing and first aid, offered by many public school systems and other community agencies, provide a useful background of knowledge for the work. Volunteer work and temporary summer jobs in hospitals and similar institutions also are helpful. Applicants should be healthy, tactful, patient, understanding, emotionally stable, and dependable. Nursing aides, as other health workers, should have a genuine desire to help people, be able to work as part of a team, and be willing to perform repetitive, routine tasks.

Opportunities for promotions are limited without further training. Some acquire specialized training to prepare for better paying positions such as hospital operating room technician.

To become licensed practical nurses, nursing aides must complete the year of specialized training required for licensing. Some in-service programs allow nursing aides to get this training while they continue to work part time.

Employment Outlook

Employment of nursing aides is expected to increase much faster than the average for all occupations through the mid-1980's. In addition to those needed because of occupational growth, many thousands of nursing aides will be needed each year to replace workers who die, retire, or leave the occupation for other reasons.

Most jobs for nursing aides and orderlies are in hospitals, but many new openings will be in nursing homes, convalescent homes, and other long-term care facilities. Major reasons for expected occupational growth are the increasing need for medical care of a growing population, including a larger proportion of elderly people; the increasing ability of people to pay for health care; and the growth of public and private health insurance. Employment opportunities also will arise as hospitals continue to delegate to nursing aides tasks which, although associated with patient care, do not require the training of registered and licensed practical nurses.

Earnings and Working Conditions

Nursing aides, orderlies, and attendants earned salaries that were below the average for all nonsupervisory workers on private payrolls, except farming. Nursing aides employed full time by nursing homes and related facilities earned considerably less than those in hospitals. Depending on the experience of the applicant, salaries of nursing aides in Veterans Administration hospitals ranged from $115 to $130 a week in late 1974.

With few exceptions, the scheduled workweek of attendants in hospitals is 40 hours or less. Because nursing care must be available to patients on a 24-hour-a-day basis, scheduled hours include nightwork and work on weekends and holidays.

Attendants in hospitals and similar institutions generally receive paid vacations which, after 1 year of service, may be a week or more in length. Paid holidays and sick leave, hospitalization and medical benefits, and pension plans also are available to many hospital employees.

Sources of Additional Information

Information about employment may be obtained from local hospitals. Additional information about the work of nursing aides, orderlies, and attendants is available from:

ANA Committee on Nursing Careers, American Nurses' Association, 2420 Pershing Rd., Kansas City, Mo. 64108.

Division of Careers and Recruitment, American Hospital Association, 840 N. Lake Shore Dr., Chicago, Ill. 60611.

THERAPY AND REHABILITATION OCCUPATIONS

Through various types of therapy, handicapped people, including the physically disabled, can learn to build satisfying and productive lives. Helping in this therapy are rehabilitation workers who use exercise, massage, heat, light, and water as well as mechanical and scientific devices to treat a variety of disorders. They work on a health care team, led by a physician, with nurses, social workers, psychologists, and vocational counselors.

This chapter presents statements on three areas of therapy and rehabilitation: speech pathology and audiology, physical therapy, and occupational therapy. Therapeutic recreation workers are discussed in the statement on Recreation Workers.

Speech pathologists and *audiologists* are the largest rehabilitation and therapy group. They help people with speech and hearing impairments to overcome their handicap.

Physical therapists and *physical therapist assistants and aides* use exercise, massage, and heat to help disabled people regain the use of their muscles.

Occupational therapists and *occupational therapy assistants* plan and lead activities which help disabled people regain coordination. Eventually, they help the patient learn a skill which can be used to find employment. They also help elderly people in nursing homes become involved in interesting and absorbing hobbies.

People who work in the therapy and rehabilitation occupations should have concern for the physical and emotional well-being of others. They must have patience and be able to establish and maintain effective personal relationships. Therapists should be stable persons, since patients who receive therapy often also need help to cope emotionally with their disability.

Other occupations also provide opportunity for work with the disabled and handicapped. Rehabilitation counselors give personal and vocational guidance to the physically, mentally, or socially handicapped. Employment counselors work with the disabled as well as the able-bodied in career planning and job adjustment. Both occupations are described elsewhere in the *Handbook*.

OCCUPATIONAL THERAPISTS

(D.O.T. 079.128)

Nature of the Work

Occupational therapists plan and direct educational, vocational, and recreational activities designed to help mentally and physically disabled patients become self-sufficient. They evaluate the capacities and skills of clients, set goals, and plan a therapy program together with the client and members of a medical team which may include physicians, physical therapists, vocational counselors, nurses, social workers, and other specialists.

About 2 therapists out of 5 works with emotionally handicapped patients, and the rest work with physically disabled persons. These clients represent all age groups and degrees of illness. Patients participate in occupational therapy to determine the extent of abilities and limitations; to regain physical, mental, or emotional stability; to relearn daily routines such as eating, dressing, writing, and using a telephone; and eventually, to prepare for employment.

Occupational therapists teach manual and creative skills such as weaving and leather working, and business and industrial skills such as typing and the use of power tools. They also plan and direct activities, especially for children. Therapists may design and make special equipment or splints to help disabled patients.

Besides working with patients, occupational therapists supervise student therapists, occupational therapy assistants, volunteers, and auxiliary nursing workers. The chief occupational therapist in hospitals may teach medical and nursing students the principles of occupational therapy. Many therapists administer occupational therapy programs, coordinate patient activities, or are consultants to local and State health departments and mental health agencies. Some teach in colleges and universities.

Places of Employment

About 9,400 people, more than 9 out of 10 of them women, worked as occupational therapists in 1974. Almost half of all occupational therapists work in hospitals. Rehabilitation centers, nursing homes, schools, outpatient clinics, community mental health centers, and research centers employ most of the others. Some work in special sanitariums or camps for handicapped children, others in State health departments. Still others work in home-care programs for patients unable to attend clinics or workshops. Some are members of the Armed Forces.

Training, Other Qualifications, and Advancement

A degree or certification in occupational therapy is required to enter the profession. In 1974, 40 colleges and universities offered programs in occupational therapy which were accredited by the American Medical Association and the American Occupational Therapy Association. All of these schools offer bachelor's degree programs. Some schools have 2-year programs and accept students who have completed 2 years of college. Some also offer shorter programs, leading to a certificate or a master's degree in occupational therapy for students who have a bachelor's degree in another field. A graduate degree often is required for teaching, research, or administrative work.

Course work in occupational therapy programs includes physical, biological, and behavioral sciences and the application of occupational therapy theory and skills. Students also work in hospitals or health agencies to gain clinical experience. After students complete the 6- to 9-month clinical practice period and graduate from their programs, they are eligible for the American Occupational Therapy Association examination to become registered occupational therapists (O.T.R.). Occupational therapy assistants who are certified by the association and have 4 years of approved work experience also are eligible to take the examination to become registered occupational therapists.

Personal qualifications needed in this profession include a sympathetic but objective approach to illness and disability. Occupational therapists also need maturity, patience, imagination, manual skills, and the ability to teach. High school students interested in careers as occupational therapists are advised to take courses in health, biology, crafts, and the social sciences.

Newly graduated occupational therapists generally begin as staff therapists. After several years on the job, they may qualify as senior therapists or specialized practitioners. Some advance to supervisory or administrative jobs in occupational therapy programs; others teach or do research.

Employment Outlook

Employment opportunities for occupational therapists are expected to be favorable through the mid-1980's. The increasing number of graduates is expected to be roughly in balance with new openings that are expected to result from growth of the occupation and replacement for those who will die, retire, or leave the field for other reasons.

Employment in this occupation is expected to grow faster than the average for all occupations due to public interest in the rehabilitation of disabled persons and the success of established occupational therapy programs. Many therapists will be needed to staff hospital rehabilitation departments, community health centers, extended care facilities, psychiatric centers, schools for children with developmental and learning disabilities, and community home health programs.

Earnings and Working Conditions

Beginning salaries for new graduates of occupational therapy programs averaged about $9,500 a year in 1974, according to a national survey conducted by the University of Texas Medical School. Experienced occupational therapists earned an average salary of about $12,500 a year; some earned as much as $14,800, and some administrators as high as $25,000 to $30,000. In 1974, the average salary of experienced occupational therapists was one and a half times the average earnings for all nonsupervisory workers in private industry, except farming.

In late 1974, beginning therapists employed by the Veterans Administration earned starting salaries of $9,473 a year. Most experienced, nonsupervisory occupational therapists earned about $12,850 annually.

Many part-time positions are available for occupational therapists. Some organizations require evening work.

Sources of Additional Information

For more information on occupational therapy as a career, write to:

American Occupational Therapy Association, 6000 Executive Blvd., Rockville, Md. 20852.

OCCUPATIONAL THERAPY ASSISTANTS

(D.O.T. 079.368)

Nature of the Work

Occupational therapy assistants work under the supervision of professional occupational therapists to help rehabilitate patients who are physically and mentally disabled. They help plan and implement programs of educa-

tional, vocational, and recreational activities that strengthen patients' muscle power, increase motion and coordination, and develop self-sufficiency in overcoming disabilities.

Occupational therapy assistants teach clients self-care skills such as dressing, eating, and shaving; work-related skills; and recreational and social activities such as games, dramatics, and gardening. They may also teach creative skills such as woodworking, ceramics, and graphic arts.

Assistants must be able to teach a broad range of skills because of the wide variety of patients. They may work either with groups or with individual patients. When treating patients with diseases, assistants usually work under the supervision of professional occupational therapists. In other situations, such as organizing crafts projects for handicapped persons living in institutions, they may function independently with only periodic consultation with professionals.

Besides working directly with patients, occupational therapy assistants may order supplies, prepare work materials, and help maintain tools and equipment. They also may keep records on patients, prepare clinical notes, and perform other clerical duties.

Places of Employment

About 7,900 people worked as occupational therapy assistants and aides in 1974; most were women. Almost half of all occupational therapy assistants work in hospitals. Others work in nursing homes for the aged, schools for handicapped children and the mentally retarded, rehabilitation and day care centers, special workshops, and outpatient clinics. A small number are members of the Armed Forces.

Training, Other Qualifications, and Advancement

Occupational therapy assistants learn their skills in vocational and technical programs. Other assistants graduate from 1- or 2-year junior or community college programs or complete an approved military occupational therapy assistant training program.

In 1974, there were 35 programs approved by the American Occupational Therapy Association. Most of these are 2-year college programs leading to an associate degree. Others are 1-year vocational and technical school programs. Graduates of these programs may be certified by the American Occupational Therapy Association and receive the title Certified Occupational Therapy Assistant (COTA). In 1974, about 1,800 employed occupational therapy assistants were COTA's.

Approved programs combine classroom instruction with at least 2 months of supervised practical experience. Courses include the history and philosophy of occupational therapy, occupational therapy theory and skills, anatomy and physiology of the human body, the effect of illness and injury on patients, and human development. Students also learn skills and crafts and their application to physical and mental disabilities.

Applicants for training programs must be high school graduates or the equivalent. Among the subjects recommended for high school students interested in the occupational therapy field are health, biology, typing, and the social sciences. Preference sometimes is given to applicants who have taken courses in science and crafts and have previous work experience in a health care setting.

Occupational therapy assistants should like people, have good physical and mental health, and be able to establish and maintain effective personal relationships. They also should have manual skills since they must teach clients how to use tools and materials.

Occupational therapy assistants who work in large health facilities

begin with routine tasks and may advance to more responsible levels as they gain experience. Experienced COTA's may take the examination to become a registered occupational therapist (OTR) after fulfilling certain requirements without completing the remaining 2 years of study for a bachelor's degree in occupational therapy.

Employment Outlook

Employment opportunities for occupational therapy assistants are expected to be very good through the mid-1980's, particularly for graduates of approved programs. Many openings will be created each year by growth in the occupation and the need to replace those who die, retire, or leave the field for other reasons. Although the number of occupational therapy assistant programs is expected to increase, the supply of new graduates is likely to fall short of demand. Thus, the outlook should be favorable for people who want to enter the field through on-the-job training.

The employment of occupational therapy assistants is expected to grow much faster than the average for all occupations, due to public interest in the rehabilitation of disabled people. All types of health care institutions, especially nursing homes and community health centers, will need more occupational therapy assistants through the mid-1980's.

Earnings and Working Conditions

In 1974, annual salaries generally ranged from $6,500 to $8,000 for inexperienced assistants. Experienced occupational therapy assistants earned between $7,500 and $10,500 a year, according to the limited information available. Those who completed an approved program generally earned higher starting salaries than beginners without any training.

Occupational therapy assistants occasionally may work evenings, weekends, and part time.

Sources of Additional Information

For information about work opportunities and programs offering training for occupational therapy assistants, contact:

American Occupational Therapy Association, 6000 Executive Blvd., Rockville, Md. 20852.

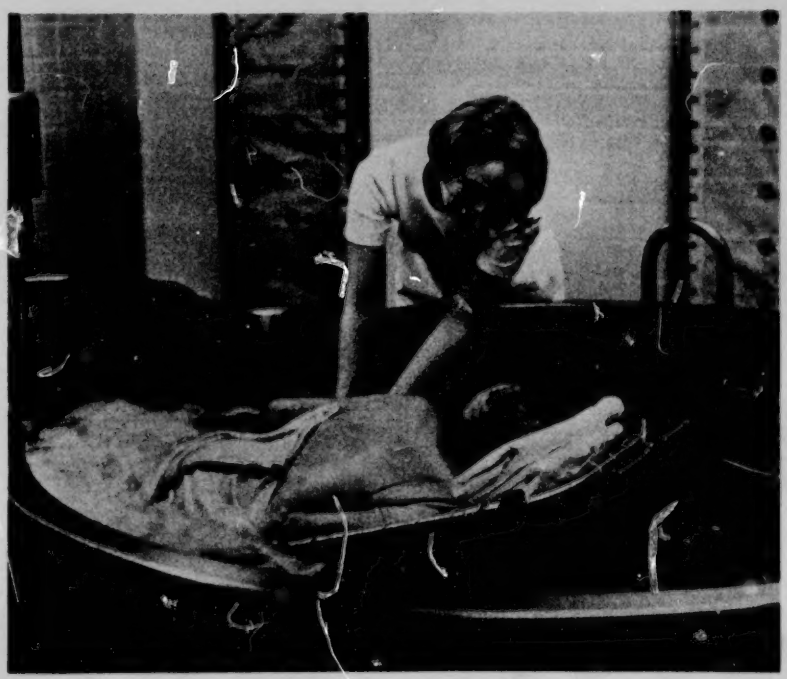
PHYSICAL THERAPISTS

(D.O.T. 079.378)

Nature of the Work

Physical therapists help persons with muscle, nerve, joint, and bone diseases or injuries to overcome their disabilities. Their patients include accident victims, crippled children, and disabled older persons. Physical therapists perform and interpret tests and measurements for muscle strength, motor development, functional capacity, and respiratory and circulatory efficiency to develop programs for treatment. They evaluate the effectiveness of the treatment and discuss the patients' progress with physicians, psychologists, occupational therapists, and other specialists. When advisable, physical therapists revise the therapeutic procedures and treatments. They help disabled persons to accept their physical handicaps and adjust to them. They show members of the patients' families how to continue treatments at home.

Therapeutic procedures include exercises for increasing strength, endurance, coordination, and range of motion; stimuli to make motor activity and learning easier; instruction in carrying out everyday activities and in the use of helping devices; and the application of massage, heat and cold, light, water, or electricity to relieve pain or improve the condition of muscles.



Most physical therapists provide direct care to patients as staff members, supervisors, or self-employed practitioners. These therapists may treat many categories of patients or may specialize in pediatrics, geriatrics, amputations, arthritis, or paralysis. Others administer physical therapy programs, teach, or are consultants.

Places of Employment

About 20,000 persons—3 out of 4 of them women—worked as licensed physical therapists in 1974. About three-fourths of all physical therapists work in hospitals or nursing homes; others, in rehabilitation centers or schools for crippled children. Some who work for public health agencies treat chronically sick patients in their own homes. Still others work in physicians' offices or clinics, teach in schools of physical therapy, or work for research organizations. A few serve as consultants in government and voluntary agencies or are members of the Armed Forces.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require a license to practice physical therapy. Applicants for a license must have a degree or certificate from a school of physical therapy and to qualify must pass a State board examination. In 1974, there were 66 schools of physical therapy which had been approved by the American Medical Association and the American Physical Therapy Association.

Most of the approved schools of physical therapy offer bachelor's degree programs. A number of schools accept those who already have a bachelor's degree and give a 12- to 16-month course leading to a certificate in physical therapy. Some schools offer both a bachelor's degree and a certificate program.

The physical therapy curriculum includes science courses such as anatomy, physiology, neuroanatomy, and neurophysiology; also specialized courses such as biomechanics of motion, human growth and development, and manifestations of disease and trauma. Besides receiving classroom instruction, students get supervised practical experience administering physical therapy to patients in a hospital or treatment center.

Several universities offer the master's degree in physical therapy. A graduate degree, combined with clinical experience, increases the opportunities for advancement, especially to teaching, research, and administrative positions.

Therapists must have patience, tact, resourcefulness, and emotional stability in order to help patients and their families understand the treatments and adjust to their handicaps. Physical therapists also should have manual dexterity and physical stamina. Many persons who want to determine whether they have the personal qualities needed for this occupation volunteer for summer or part-time work in the physical therapy department of a hospital or clinic. High school courses that are useful include health, biology, social science, mathematics, and physical education.

Employment Outlook

Employment opportunities for physical therapists are expected to be favorable through the mid-1980's. The rapidly growing number of new graduates is expected to be in rough balance with the average number of openings that will result each year from growth in the occupation and from replacement of those who will die or retire. Employment opportunities will be best in suburban and rural areas.

Employment of physical therapists is expected to grow much faster than the average for all occupations through the mid-1980's because of increased public recognition of the importance of rehabilitation. As programs to aid crippled children and other rehabilitation activities expand, and as growth takes place in nursing homes and other facilities for the elderly, many new positions for physical therapists are likely to be created. Many part-time positions should continue to be available.

Earnings and Working Conditions

Starting salaries for new physical therapy graduates averaged about $9,600 a year in 1974, according to a national survey conducted by the University of Texas Medical School at Galveston. Earnings of experienced physical therapists averaged $11,500; some earned as much as $16,000.

Beginning therapists employed by the Veterans Administration (VA) earned starting salaries of $9,473 a year in late 1974. Most experienced nonsupervisory physical therapists in the VA earned $12,841 annually; those who were supervisors, about $18,463.

Sources of Additional Information

Additional information and locations of institutions offering approved programs in physical therapy are available from:

American Physical Therapy Association, 1156 15th St. NW., Washington, D.C. 20036.

PHYSICAL THERAPIST ASSISTANTS AND AIDES

(D.O.T. 355.878)

Nature of the Work

Physical therapist assistants and aides work under the supervision of professional physical therapists to rehabilitate disabled persons so that

they may again lead useful and productive lives. They work to restore physical functions and prevent disability from injury or illness.

Assistants help physical therapists perform tests on patients to determine the best treatment for them. They use special therapy equipment to apply heat, cold, light, ultra sound, and massage, and report to their supervisors the patient's response to treatment. Assistants also help patients perform therapeutic exercises as well as everyday activities such as walking and climbing stairs. They instruct patients in the use of artificial limbs, braces, and splints.

Physical therapist aides help patients prepare for treatment, and may remove and replace devices such as braces, splints, and slings and transport patients to and from treatment areas. They may help assistants or therapists in administering treatment to patients. Aides care for and assemble physical therapy treatment equipment. They also make appointments, act as receptionists, and perform other clerical duties.

Some small health care institutions employ only one person besides the therapist in the physical therapy department. In this case, the assistant or aide assumes most of the duties of the therapist, within the limits of his or her training.

Places of Employment

About 10,500 persons worked as physical therapist assistants and aides in 1974; most of them were women. Most work in physical therapy departments of general and specialized hospitals. Others work in physicians' or physical therapists' offices and clinics, rehabilitation centers, or nursing homes for the chronically ill and elderly. Some community and government health agencies, schools for crippled children, and facilities for the mentally retarded also employ physical

therapist assistants and aides. A small number are members of the Armed Forces.

Training, Other Qualifications, and Advancement

In 1974, 17 States licensed physical therapist assistants who had completed an approved 2-year associate degree program. Two of these States also licensed as physical therapist assistants experienced aides who passed a proficiency test and who had learned their skills before associate degree programs were available.

There were 42 programs for physical therapist assistants in 1974; most were in junior or community colleges. Courses include history and philosophy of rehabilitation, human growth and development, anatomy and physiology, and psychology. A course in physical therapist assistant procedures covers massage, therapeutic exercises, heat and cold therapy, and functional activities. Supervised clinical experience also is a requirement of physical therapist assistant programs.

Physical therapist aides qualify for their occupation through training received on the job in hospitals and other health care facilities. The length and content of on-the-job programs vary widely, depending on the level of duties that aides are permitted to perform, the particular services required by different patients when the program is in progress, and the amount of time professional physical therapists can spend teaching trainees. Applicants admitted to on-the-job training programs for physical therapist aides generally must be high school graduates or the equivalent. High school courses that are useful include health, biology, social science, physical education, typing, and mathematics. Employers usually prefer that aides have previous hospital experience as nursing aides.

Physical therapist assistants and aides need good physical and mental health, manual dexterity to adjust equipment, body coordination to assist in positioning patients, and an interest in helping the physically handicapped.

As physical therapist assistants and aides gain experience, they may advance to more responsible duties with corresponding pay increases. Advancement opportunities for aides are best in areas where associate degree programs for physical therapist assistants are not available.

Employment Outlook

Job opportunities for physical therapist assistants and aides are expected to be excellent through the mid-1980's. In communities where there are large classes in a physical therapist assistant program, some graduates may find it necessary to move to other locations where no associate degree programs are available. On the national level, however, openings for physical therapist assistants caused by growth and replacement needs will far exceed graduates from these programs.

The number of physical therapist assistants and aides is expected to increase much faster than the average for all occupations as the

demand for professional physical therapists grows. Overall demand in the physical therapy field stems from increased public awareness of the importance of rehabilitation and the growing number of nursing homes which provide therapeutic services to the elderly. Expanded physical therapy services planned by hospitals, nursing homes, schools for crippled children, facilities for mentally retarded, and other health and rehabilitation centers are expected to further increase the need for physical therapist assistants and aides.

Earnings and Working Conditions

In 1974, weekly salaries averaged about $104 for beginning physical therapist aides and about $150 for those with experience, according to the limited information available. Physical therapist assistants received higher salaries than aides, beginning at about $145 a week. Experienced physical therapists assistants earned as much as $220 weekly.

Sources of Additional Information

Information on a career as a physical therapist assistant or aide and on programs offering training for physical therapist assistant is available from:

The American Physical Therapy Association, 1156 15th St. NW., Washington, D.C. 20005.

SPEECH PATHOLOGISTS AND AUDIOLOGISTS

(D.O.T. 079.108)

Nature of the Work

About 1 out of 10 Americans is unable to speak or hear clearly. Children who have trouble speaking or hearing cannot participate fully with other children in play or in normal classroom activities. Adults having speech or hearing impairments often have problems in job adjustment. Speech pathologists and audiologists provide direct services to these people by evaluating their speech or hearing disorders and then providing treatment.

The speech pathologist works with children and adults who have speech, language, and voice disorders resulting from causes such as total or partial hearing loss, brain injury, cleft palate, mental retardation, emotional problems, or foreign dialect. The audiologist primarily assesses and treats hearing problems. Speech and hearing, however, are so interrelated that to be competent in one of these fields, one must be familiar with both.

The duties of speech pathologists and audiologists vary with education experience, and place of employment. In clinics, either in schools or other locations, they use diagnostic procedures to identify and evaluate speech and hearing disorders. Then, in cooperation with physicians, psychologists, physical therapists, and counselors, they develop and implement an organized program of therapy. Some speech pathologists and audiologists conduct research such as investigating the causes of communicative disorders and improving methods for clinical services. Others supervise clinical activities or do other administrative work.

Speech pathologists and audiologists in colleges and universities instruct in the principles of communication, communication disorders, and clinical techniques; participate in educational programs with physicians, nurses, and teachers; and work in university clinics and research centers. Most speech pathologists and audiologists have some administrative responsibilities. However, directors of speech and hearing clinics, and coordinators of speech and hearing in schools, health departments, or government agencies, may be totally involved in administration.

Places of Employment

Over 31,000 persons, three-fourths of them women, worked as speech pathologists and audiologists in 1974. Over one-half worked in public schools. Colleges and universities employed many in classrooms, clinics, and research centers. The rest worked in hospitals, speech and hearing centers, government agencies, industry, and private practice.

Training, Other Qualifications, and Advancement

An increasing number of States require a master's degree or its equivalent for speech pathologists and audiologists. In addition, many Federal programs, such as Medicare and Medicaid, require participating speech pathologists and audiologists to have a master's degree. Some States require a teaching certificate to work in the public schools.

Undergraduate courses in speech pathology and audiology include anatomy, biology, physiology, physics, linguistics, semantics, and phonetics. Courses in speech and hearing as well as in child psychology and psychology of the exceptional child are also helpful. This training is usually available at colleges that offer a broad liberal arts program.

In early 1975, about 225 colleges and universities offered graduate education in speech pathology and audiology. Courses at the graduate level include advanced anatomy and physiology of the areas involved in hearing and speech, acoustics, and psychological aspects of communication. Training also is given in the analysis of speech production, language abilities, and auditory processes. Graduate students gain a familiarity with research methods used to study speech and hearing.

Scholarships, fellowships, assistantships, and traineeships are available in this field. Teaching and training grants to colleges and universities that have programs in speech and hearing are given by the U.S. Rehabilitation Services Administration, the Maternal and Child Health Service, the U.S. Office of Education, and the National Institutes of Health. In addition, some Federal agencies distribute money to colleges to aid graduate students in speech and hearing programs. A large number of private organizations and foundations also provide financial assistance for education in this field.

Meeting the American Speech and Hearing Association's (ASHA) requirements for a Certificate of Clinical Competence usually is necessary in order to advance professionally and to earn a higher salary. To earn the CCC, a person must have a master's degree or its equivalent and complete a 1-year internship approved by the Association. Passing a national written examination also is required.

Speech pathologists and audiologists should be able to approach problems objectively and have a concern for the needs of others. They sould also have considerable patience, because a client's progress often is slow. A person who desires a career in speech pathology and audiology should be able to accept responsibility, work independently, and direct others. The ability to work with detail is important. Speech pathologists and audiologists receive satisfaction from seeing the results of their work.

Employment Outlook

The employment of speech pathologists and audiologists is expected to increase much faster than the average for all other occupations through the mid-1980's. However, temporary reductions in government spending on speech and hearing programs may decrease the number of new positions available at any one time. Although some jobs will be available for those having only a bachelor's degree, the increasing emphasis placed on the master's degree by State governments, school systems, and Federal agencies will limit opportunities at the bachelor's degree level.

Although employment opportunities for those with a master's degree should generally be favorable, the large number of graduates entering this field may cause some competition. Many openings will occur outside of the large metropolitan areas and some graduates will have to relocate in order to find employment. Competition for teaching positions in colleges and universities will be very strong throughout the period.

Population growth, which will increase the number of persons having speech and hearing problems, is one of the factors underlying the expected expansion in employment of speech pathologists and audiologists through the mid-1980's. In addition, there is a trend toward earlier recognition and treatment of hearing and language problems in children. Many school-age children, thought to have learning disabilities, actually have language or hearing disorders which speech pathologists and audiologists can treat.

Other factors expected to increase demand for speech pathologists and audiologists are expansion in expenditures for medical research and the growing public interest in speech and hearing disorders. These are illustrated by State and Federal laws, which provide for the education of handicapped children, and expanded speech and hearing services available under Federal programs such as Medicare and Medicaid.

Earnings and Working Conditions

Starting salaries for speech pathologists and audiologists with a master's degree averaged over $10,200 a year in early 1975. Salaries for persons with considerable experience (6-10 years) averaged about $13,300. Those with a doctoral degree earned average salaries of between $17,000 and $25,000, depending on the job setting and geographic region. Salaries tend to be higher in areas having large urban populations. Many speech pathologists and audiologists, particularly those in colleges and universities, supplement their incomes acting as consultants, engaging in research projects, and writing books and articles.

In early 1975, the annual starting salary in the Federal Government for speech pathologists and audiologists with a master's degree was $12,841. Those having a doctoral degree were eligible to start at $15,481.

Many speech pathologists and audiologists work over 40 hours a week. Almost all receive fringe benefits such as paid vacations, sick leave, and retirement programs.

Sources of Additional Information

State departments of education can supply information on certification requirements for those who wish to work in public schools.

A list of college and university programs and a booklet on student financial aid as well as general career information are available from:

American Speech and Hearing Association, 9030 Old Georgetown Rd., Washington, D.C. 20014.

OTHER HEALTH OCCUPATIONS

DIETITIANS

(D.O.T. 077.081 through .168)

Nature of the Work

Dietitians plan nutritious and appetizing meals to help people maintain or recover good health. They also supervise the food service workers who prepare and serve the meals, manage purchases and keep the accounts, and give advice on good eating habits. Administrative dietitians form the largest group in this occupation; the others are clinical, teaching, and research dietitians. Nutritionists also are included in this field.

Administrative dietitians apply the principles of nutrition and sound management to large-scale meal planning and preparation, such as that done in hospitals, universities, schools, and other institutions. They supervise the planning, preparation, and service of meals; select, train, and direct food-service supervisors and workers; budget for and purchase food, equipment, and supplies; enforce sanitary and safety regulations; and prepare records and reports. Dietitians who are directors of a dietetic department also decide on departmental policy; coordinate dietetic service with the activities of other departments; and are responsible for the development and management of the dietetic department budget, which in large organizations may amount to millions of dollars annually.

Clinical dietitians, sometimes called therapeutic dietitians, plan diets and supervise the service of meals to meet the nutritional needs of patients in hospitals, nursing homes, or clinics. Among their duties, clinical dietitians confer with doctors and other members of the health care team about patients' nutritional care, instruct patients and their families on the requirements and importance of their diets, and suggest ways to help them stay on these diets after leaving the hospital or clinic. In a small institution, one person may be both the administrative and clinical dietitian.

Research dietitians conduct, evaluate, and interpret research to improve the nutrition of both healthy and sick people. This research may be in nutrition science and education, food management, or food service systems and equipment. They conduct studies and make surveys of food intake, food acceptance, and food utilization. Research projects may relate to subjects such as nutritional needs of the aging, persons with a chronic disease, or space travelers. Research dietitians usually are employed in medical centers or education facilities, but also may work in community health programs. (See statement on Food Scientists elsewhere in the *Handbook*.)

Dietetic educators teach nutrition to dietetic, medical, dental, and nursing students and to interns, residents, and other members of the health care team. This may be in medical and educational institutions.

Nutritionists counsel people of all ages, as individuals or in groups, on sound nutrition practices to maintain and improve health. This includes special diets, meal planning and preparation, and food budgeting and purchasing. Nutritionists in the public health field are responsible for planning, developing, administering, and coordinating nutrition programs and services as part of public health programs. Nutritionists work in such diverse areas as food industries, educational and health facilities, and agricultural and welfare agencies, both public and private.

An increasing number of dietitians work as consultants to hospitals and to health-related facilities. Others act as consultants to commercial enterprises, including food processors and equipment manufacturers.

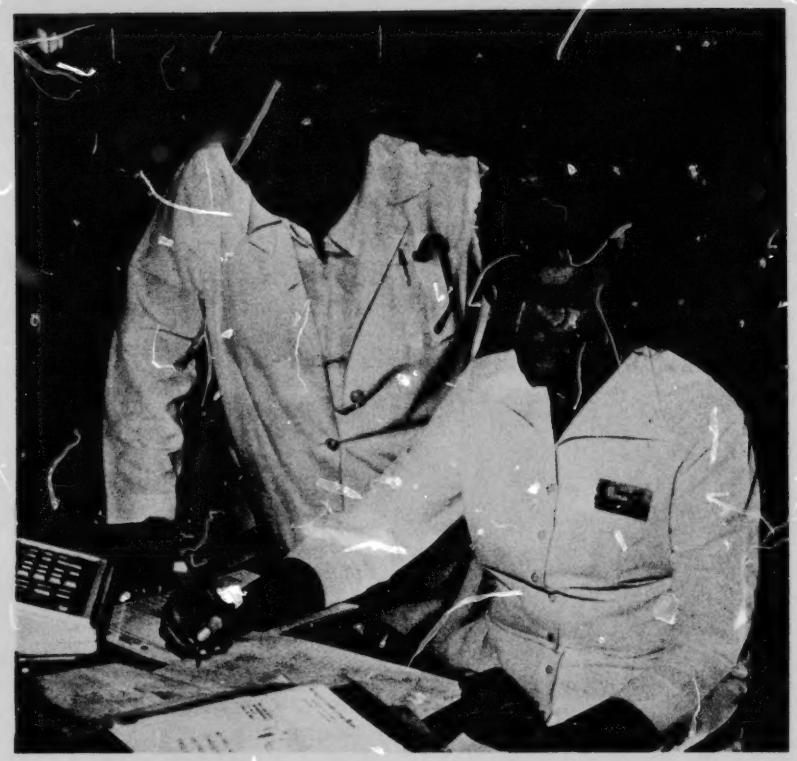
Places of Employment

About 33,000 persons, most of them women, worked as dietitians in 1974. More than two-fifths work in hospitals, nursing homes, and clinics, including about 1,000 in the Veterans Administration and the U.S. Public Health Service. Colleges, universities, and school systems employ a large number of dietitians as teachers or in food service systems. Most of the rest work for health-related agencies, restaurants or cafeterias, and large companies that provide food service for their employees. Some dietitians are commissioned officers in the Armed Forces.

Training, Other Qualifications, and Advancement

A bachelor's degree, preferably with a major in foods and nutrition or institution management, is the basic educational requirement for dietitians. This degree can be earned in more than 250 colleges and universities, usually in departments of home economics. College courses usually required are in food and nutrition, institution management, chemistry, bacteriology, physiology, and related courses such as mathematics, data processing, psychology, sociology, and economics.

For a dietitian to qualify for



professional recognition, the American Dietetic Association (ADA) recommends the completion after graduation of an approved dietetic internship or an approved individual traineeship program. The internship lasts 6 to 12 months and the traineeship program 1 to 2 years. Both programs combine clinical experience under a qualified dietitian with some classroom work. In 1974, 71 internship programs were approved by the American Dietetic Association. A growing number of coordinated undergraduate programs, located in schools of medicine and in allied health and home economics departments of both colleges and universities, enable students to complete both the requirements for a bachelor's degree and the clinical experience requirement in 4 years.

Experienced dietitians may advance to assistant or associate director or director of a dietetic department. Advancement to higher level positions in teaching and research usually requires graduate education; public health nutritionists must earn a graduate degree in this field. Graduate study in institutional or business administration is valuable to those interested in administrative dietetics.

Persons who plan to become dietitians should have organizational and administrative ability, as well as high scientific aptitude, and should be able to work well with a variety of people. Among the courses recommended for high school students interested in careers as dietitians are home economics, business administration, biology, health, mathematics, and chemistry.

Employment Outlook

Employment opportunities for qualified dietitians on both a full-time and part-time basis are expected to be good through the mid-1980's. In recent years, employers increasingly have utilized dietetic assistants trained in vocational and technical schools and dietetic technicians educated in junior colleges to help meet demands for dietetic services. Since this situation is likely to persist, employment opportunities also should continue to be favorable for graduates of these programs.

Employment of dietitians is expected to grow faster than the average for all occupations through the mid-1980's to meet the nutrition and food management needs of hospitals and extended care facilities, industrial plants, and restaurants. Dietitians also will be needed to staff community health programs and to conduct research in food and nutrition. In addition to new dietitians needed because of occupational growth, many others will be required each year to replace those who die, retire, or leave the profession for other reasons.

Earnings and Working Conditions

Starting salaries of hospital dietitians averaged $9,900 a year in 1974, according to a national survey conducted by the University of Texas Medical Branch. Experienced dietitians received annual salaries ranging from $12,100 to $22,000, according to the American Dietetic Association. Colleges and universities paid dietitians with bachelor's degrees median salaries of $12,100 a year in 1974. Those with bachelor's degrees working in commercial or industrial establishments received median salaries of $12,500 a year; those in public and voluntary health agencies, $10,800. Self-employed dietitians with a bachelor's degree earned median salaries over $14,000 a year, in 1974.

The entrance salary in the Federal Government for those completing an approved internship

was $10,520 in late 1974. Beginning dietitians with a master's degree who had completed an internship earned $12,841. In late 1974, the Federal Government paid experienced dietitians average salaries of $17,414 a year.

Most dietitians work 40 hours a week; however, dietitians in hospitals may sometimes work on weekends, and those in commercial food service have somewhat irregular hours. Some hospitals provide laundry service and meals in addition to salary. Dietitians usually receive paid vacations, holidays, and health insurance and retirement benefits.

Sources of Additional Information

For information on approved dietetic internship programs, scholarships, and employment opportunities, and a list of colleges providing training for a professional career in dietetics, contact:

The American Dietetic Association, 430 North Michigan Ave., 10th floor, Chicago, Ill. 60611

The U.S. Civil Service Commission, Washington, D.C. 20415, will send information on the requirements for dietetic interns and dietitians in Federal Government hospitals and for public health nutritionists in the Indian Health Service of the Public Health Service and in the District of Columbia government.

DISPENSING OPTICIANS

(D.O.T. 713.251, .381, .884, and 299.884)

Nature of the Work

About 90 million people in the United States use some form of corrective eye device. Dispensing opticians (also called *ophthalmic dispensers*) adjust finished glasses to fit the customer. In many States they also fit contact lenses.

Dispensing opticians determine where lenses should be placed in relation to the customer's eyes by measuring the distance between the centers of the pupils. They also assist the customer in selecting the proper eyeglass frame by measuring the customer's facial features and showing the various styles and colors of frames.

Dispensing opticians prepare work orders that give ophthalmic laboratory technicians the information they need to interpret prescriptions properly, grind the lenses, and insert them in a frame. The work orders include lens prescriptions; information on lens size, color, and style. After glasses are made, dispensing opticians adjust the frame to the contours of the customer's face and head so that it fits properly and comfortably. Adjustments are made with handtools, such as optical pliers, files, and screwdrivers. A special instrument is used to check the power and surface quality of the lenses.

In fitting contact lenses, dispensing opticians follow ophthalmologists' or optometrists' prescriptions, measure the corneas of customers' eyes and then prepare specifications to be followed by the lens manufacturer. Contact lens fitting requires considerably more skill, care, and patience than conventional eyeglass fitting. Dispensing opticians tell customers how to insert, remove, and care for contact lenses during the initial adjustment period, which may last several weeks. The dispensing optician examines the patient's eyes, cornea, lids, and contact lens with special instruments and microscopes at each visit. Ophthalmologists or optometrists recheck their fit, as needed. Opticians may make minor adjustments; lenses are returned to the manufacturer for major changes.

The majority of dispensing opticians are in the general practice of designing and fitting eyeglasses. Some specialize in the fitting of cosmetic shells to cover blemished eyes. Still others specialize in the fitting of prosthesis (artificial eyes).

Places of Employment

About 17,000 persons worked as dispensing opticians in 1974. Most dispensing opticians work for retail optical shops or department stores and other retail stores that sell prescription lenses. Many also work for ophthalmologists or optometrists who sell glasses directly to patients. A few work in hospitals and eye clinics and teach in schools of ophthalmic dispensing. Many dispensing opticians own retail optical shops.

Dispensing opticians can be found in every State. However, employment is concentrated in large cities and in populous States.

Training, Other Qualifications, and Advancement

Most dispensing opticians learn their skills on the job. On-the-job training in dispensing work may last several years and usually includes

instruction in optical mathematics, optical physics, and the use of precision measuring instruments.

Formal institutional training for the dispensing optician is available for high school graduates. In 1974, 13 schools offered 2-year full-time courses in optical fabricating and dispensing work leading to an associate degree. In addition, large manufacturers of contact lenses offer nondegree courses in lens-fitting that usually last a few weeks. A small number of opticians learn their trade in the Armed Forces.

High school graduates also can prepare for optical dispensing work through 3- to 4-year formal apprenticeship programs. Apprentices with exceptional ability may complete their training in a shorter period.

Employers prefer applicants for entry jobs as dispensing opticians to be high school graduates who have had courses in the basic sciences. A knowledge of physics, algebra, geometry, and mechanical drawing is particularly valuable. The interest and ability to do precision work are essential. Because dispensing opticians deal directly with the public, they should be tactful and have pleasant personalities.

In 1974, 19 States had licensing requirements governing dispensing opticians: Alaska, Arizona, California, Connecticut, Florida, Georgia, Hawaii, Kentucky, Massachusetts, Nevada, New Jersey, New York, North Carolina, Rhode Island, South Carolina, Tennessee, Vermont, Virginia, and Washington. Some of these States also require licenses for optical mechanics in retail optical shops. To obtain a license, the applicant generally must meet certain minimum standards of education and training, and also must pass either a written or practical examination, or both. For specific requirements, the licensing boards of individual States should be consulted.

Many dispensing opticians go into business for themselves. Others may advance by becoming managers of retail optical stores or becoming sales representatives for wholesalers or manufacturers of eyeglasses or lenses.

Employment Outlook

Employment of dispensing opticians is expected to increase much faster than the average for all occupations through the mid-1980's. In addition to the job openings from employment growth, some openings will arise from the need to replace experienced workers who retire, die or transfer to other occupations.

Demand for prescription lens is expected to increase as a result of growth in the population, rising literacy and educational levels, and a large increase in the number of older persons (a group most likely to need glasses). State programs to provide eye care for low-income families, union health insurance plans, and Medicare also will stimulate demand. Moreover, the growing variety of frame styles and colors may encourage individuals to buy more than one pair of glasses.

Employment opportunities will be particularly favorable for dispensing opticians who have associate degrees in opticianry. Opportunities will be best in metropolitan areas because many of the retail optical shops in small communities are operated solely by owners and do not need dispensing opticians.

Earnings and Working Conditions

Hourly wage rates for dispensing opticians ranged from $4 to $6.70 in 1974, based on information from a small number of union contracts. Dispensing opticians who own their own shops can earn considerably more.

Working conditions are generally pleasant, quiet, and clean. Dispensing opticians in retail shops generally work a 5-1/2- or 6-day week.

Some dispensing opticians are members of unions. The principal union in this field is the International Union of Electrical, Radio and Machine Workers (AFL-CIO).

Sources of Additional Information

A list of schools offering courses for people who wish to become dispensing opticians is available from:

Coalition of Independent Ophthalmic Professionals, 75 E. 55th St., New York, N.Y. 10022.

National Academy of Opticianry, 514 Chestnut St., Big Rapids, Mich. 49307.

For general information about the occupation, contact:

Coalition of Independent Ophthalmic Professionals, 75 E. 55th St., New York, NY. 10022.

International Union of Electrical, Radio and Machine Workers, 1176 16th St. NW., Washington, D.C. 20036.

Opticians Association of America, 1250 Connecticut Ave. NW., Washington, D.C. 20036.

HEALTH SERVICES ADMINISTRATORS

(D.O.T. 169.168, 187.118, and 187.168)

Nature of the Work

Medical and health care is provided by organizations that vary from large teaching hospitals to small walk-in clinics. Each of these requires effective management to function properly. Health administrators, under the general supervision of boards of directors or other governing bodies, provide this management.

Administrators coordinate the various functions and activities that combine to make an organization work. They may do this personally, where the organization is small, or through a staff of assistant adminis-

trators in larger organizations. They make management decisions on matters such as the need for additional personnel and equipment, current and future space requirements, and the budget.

Some health services administrators, including those who manage hospitals or nursing homes, oversee nursing and food services, and in-service training programs. Although assistant administrators usually direct the daily operations of these departments, the chief executive remains informed through formal and informal meetings with assistants, the medical staff, and others. In addition to these management activities, many health administrators help to carry out fundraising drives and promote the public's participation in health programs. This phase of the administrator's job often includes speaking before civic groups, arranging publicity, and coordinating the activities of the organization with those of government or community agencies.

Places of Employment

About 150,000 persons worked as health services administrators in 1974—nearly half of them were women. Most administrators work for health facilities, including hospitals (which employed 4 out of every 10 administrators), nursing and personal care homes, and health management firms that provide administrative services to health facilities at a specified contract price.

Some health administrators work for government agencies, including State and local health departments and the U.S. Public Health Service. In addition, the Federal Government hires administrators in Veterans Administration and Armed Forces hospitals and clinics. Others work for voluntary health agencies that conduct research and provide care and treatment for victims of particular diseases or physical impairments.

Training, Other Qualifications, and Advancement

Educational requirements for health services administrators vary according to the position's level of responsibility and the size of the organization. Generally, larger organizations with more complicated administrative structures require higher credentials than smaller ones.

Applicants with a master's degree in health or hospital administration may be hired as associate or assistant administrators in hospitals, while those with master's degrees in public health often find work as program analysts or program representatives in public health departments. Very few master's degree recipients find entry positions in nursing or personal care homes, although many nursing home administrators pursue graduate education while employed.

Bachelor's degree recipients usually begin their careers as administrative assistants or department heads in hospitals, or as assistant administrators in nursing homes. Graduates of 2-year, associate degree programs generally are hired as unit directors or assistant department heads in hospitals, or as assistants to program representatives in public health departments. Some associate degree holders find assistant administrator jobs in small nursing homes.

The Ph. D. degree usually is required for positions in teaching or research, and the doctorate is an asset for those seeking administrative jobs in the larger, more prestigious health organizations. Although some public health departments still require chief administrators to be physicians, the trend is away from this.

Administrators in Armed Forces hospitals are career military personnel.

In 1974, about 40 bachelor and associate degree programs in health services administration were offered—the majority were 4-year curriculums. In addition, about 40 programs in hospital or health services administration led to the master's degree, and 17 schools of public health offered programs toward a master's degree in public health.

To enter graduate programs, applicants must have a bachelor's degree, with courses in natural sciences, psychology, sociology, statistics, accounting, and economics. The programs generally last about 2 years and include some supervised administrative experience in hospitals, clinics, or health agencies. Programs may include courses such as hospital organization and management, accounting and budget control, personnel adminstration, public health administration, and the economics of health care.

In all 50 States and the District of Columbia, the administrator of a nursing or personal care home must be licensed. Requirements are not uniform, but they generally specify a level of education, such as a bachelor's degree, plus some amount of experience in the field.

Personal qualifications needed for success as a health administrator include initiative and an interest in helping the sick. Administrators should be able to work with and motivate people, and organize and direct large-scale activities. They also should enjoy public speaking.

Health administrators advance in the profession by taking increasingly more responsible positions. For example, some hospital administrators begin their careers in small hospitals in positions with broad responsibilities, such as assistant administrator. They advance by moving to jobs as associate or chief administrator in larger hospitals. More commonly, they start in a large institution in a position that is somewhat narrow in scope; for example, as department head in charge of purchasing. Regardless of the path of advancement chosen, the ultimate occupational goal in hospitals and nursing homes is the job of chief executive or chief administrative officer.

Employment Outlook

The number of graduate programs in health administration has increased rapidly in recent years and administative specialists with graduate degrees in other fields also have entered the profession. Consequently, it may become increasingly difficult for those with less than graduate education to enter health administration in top management positions. In addition, some administrative jobs will continue to be filled by physicians, registered nurses, and members of religious communities.

Employment of health services administrators is expected to grow much faster than the average for all occupations to 1985 as the quality and quantity of patient services increase and hospital management becomes more complex. The demand for administrators will be stimulated by the formation of more group medical practices and health maintenance organizations (facilities that offer subscribers a broad range of medical services for a monthly fee paid in advance). Administrators also will be needed in nursing and convalescent homes to handle the increasing amount of administrative work expected as these facilities expand in size.

Earnings and Working Conditions

Salaries of hospital administrators depend on factors such as the level of job responsibility and the size, type, and location of the hospital, and the size of its administrative staff and budget. The average starting salary of administrative assistants in hospitals was about $10,500 in 1974, according to the limited information available.

Chief administrators in hospitals with 100 or fewer beds earned from about $16,500 to $20,000 a year in 1974. Some, in larger hospitals, earned over $40,000. Recent recipients of master's degrees in health administration starting work in Veterans Administration (VA) hospitals earned $12,167 a year in 1974. The average salary paid administrators of Federal hospitals was $23,000.

Commissioned officers in the Armed Forces who work as hospital administrators hold ranks ranging from second lieutenant to colonel or from ensign to captain. Commanding officers of large Armed Forces hospitals are physicians, who may hold higher ranks. Hospital administrators in the U.S. Public Health Service are commissioned officers holding ranks ranging from lieutenant (junior grade) to captain in the Navy.

Administrators of nursing and personal care homes usually earn lower salaries than those paid hospital administrators in facilities having similar numbers of beds. Most administrators employed by voluntary health agencies earned between $15,000 and $30,000 a year in 1974.

Health administrators often work long hours. Because health facilities such as nursing homes and hospitals operate around the clock, administrators in these institutions may be called at all hours to settle emergency problems. Also, some travel may be required to attend meetings or, in the case of State public health department and voluntary health agency administrators, to inspect facilities in the field.

Sources of Additional Information

Information about health ad-

ministration and the academic programs in this field offered by universities, colleges, and community colleges is available from:

American College of Hospital Administration, 840 North Lake Shore Drive, Chicago, Illinois 60604.

Association of University Programs in Health Administration, One Dupont Circle, NW., Washington, D.C. 20036.

American Public Health Association, Division of Program Services, 1015 18th St., NW., Washington, D.C. 20036.

National Health Council, Health Careers Program, 1740 Broadway, New York, N.Y. 10019.

MEDICAL RECORD ADMINISTRATORS

(D.O.T. 100.388)

Nature of the Work

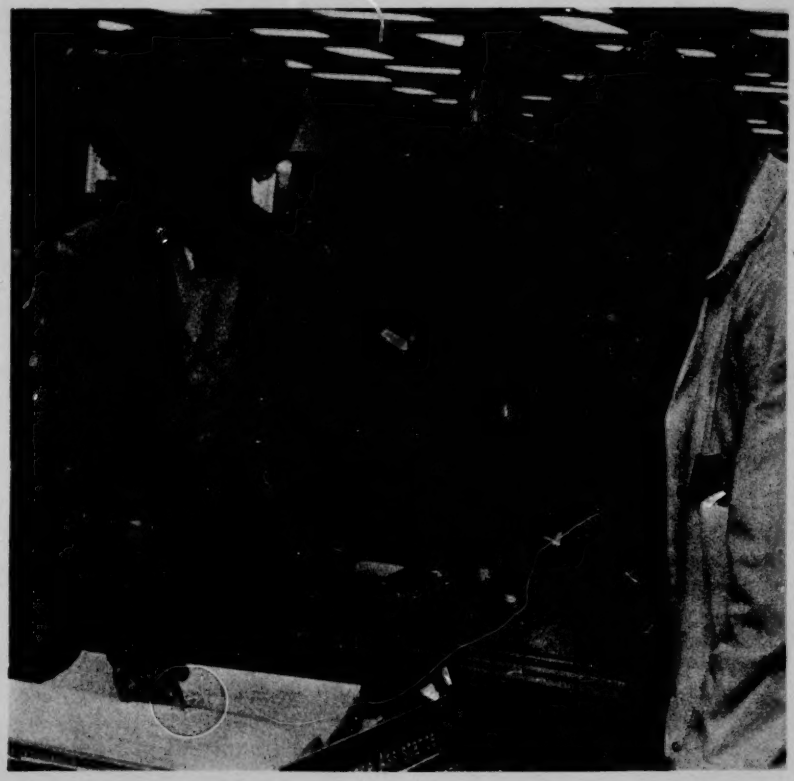
All health care institutions keep records that contain medical information on each patient, including case histories of illnesses or injuries, reports on physical examinations, X-rays and laboratory tests, doctors' orders and notes, and nurses' notes. These records are necessary for correct and prompt diagnosis and treatment of illnesses and injuries. They also are used for research, insurance claims, legal actions, evaluation of treatment and medications prescribed, and in the training of medical personnel. Medical information in hospitals is also used to evaluate patient care provided in the hospital and as a basis for health care planning for the community.

Medical record administrators, formerly known as medical record librarians, direct the activities of the medical record department and develop systems for documenting, storing, and retrieving medical information. They supervise the medical record staff which processes and analyzes records and reports on patients' illnesses and treatment. They train members of the medical record staff for specialized jobs, compile medical statistics required by State or National health agencies, and assist the medical staff in evaluations of patient care or research studies. Medical record administrators serving as department heads are a part of the hospital management staff and participate fully in management activities. As the administrators responsible for the medical information system, they may be required to testify in court about records and record procedures.

The size and type of institution affect the duties and amount of responsibility assigned to medical record administrators. In large hospitals, chief medical record administrators supervise other medical record administrators, technicians, and clerks. Smaller hospitals may employ only two or three persons in the medical record department and in nursing homes usually one person keeps the medical records. In these cases a consulting medical record administrator usually advises technical and clerical personnel performing medical record functions.

Places of Employment

Most of the nearly 12,000 medical record administrators employed in 1974 worked in hospitals. The remainder worked in clinics, nursing homes, State and local public health departments, and medical research centers. Some health insurance companies also employ medical record administrators to help determine liability for payment of their clients' medical fees. Some medical record administrators work for firms that manufacture equipment for recording and processing medical data and develop and print health insurance and medical forms. Many small



health care facilities hire medical record administrators as consultants. Although most medical record administrators are women, the number of men in the occupation is growing.

Training, Other Qualifications, and Advancement

Preparation for a career as a medical record administrator is offered in specialized programs in colleges and universities. Most programs last 4 years and lead to a bachelor's degree in medical record administration. However, concentration in medical record administration begins in the third or fourth year of study, making transfer from a junior college possible. One-year certificate programs also are available for those who already have a bachelor's degree and required courses in the liberal arts and biological sciences. In 1974, there were 40 programs in medical record administration approved by the Council on Medical Education of the American Medical Association and the American Medical Record Association (AMRA). High school courses that are useful include health, business administration, mathematics, and biology.

Training for medical record administrators includes both classroom instruction and practical experience. Anatomy, physiology, fundamentals of medical science, medical terminology, and medical record science are among the required scientific courses. In addition, management courses such as hospital organization and administration, health law, statistics, and data processing are part of the curriculum. Experience in the medical record departments of hospitals provides students with a practical background in applying standardized medical record practices, compiling statistical reports, analyzing data, and organizing medical record systems.

Graduates of approved schools in medical record administration are eligible for the national registration examination given by AMRA. Passing this examination gives professional recognition as a Registered Record Administrator (RRA). There were about 5,000 employed RRA's in 1974, according to AMRA.

Medical record administrators must be accurate and interested in detail. They also must be able to communicate clearly in speech and writing. Because medical records are confidential, medical record administrators must be discreet in processing and releasing information. Supervisors must be able to organize and analyze work procedures and to work effectively with other hospital personnel.

Medical record administrators with some experience in smaller health facilities may advance to positions as department heads in large hospitals or to higher level positions in hospital administration. Some coordinate the medical record departments of several small hospitals. Others move on to medical record positions in health agencies. Many teach in the expanding programs for medical record personnel in 2- and 4-year colleges and universities.

Employment Outlook

Employment opportunities for graduates of approved medical record administrator programs are expected to be very good through the mid-1980's. Employment is expected to grow faster than the average for all occupations, with the increasing use of hospitals and other health facilities as more and more people are covered by health insurance. The detailed information required by third-party payers such as insurance companies and Medicare also will cause some growth in the occupation. More consultants will be needed to standardize health records in outpatient clinics, community health centers, nursing homes, and home care programs. The importance of medical records in research and the growing use of computers to store and retrieve medical information also should increase the demand for qualified medical record administrators to develop new medical information systems. Part-time employment opportunities also should be available in teaching, in research, and in consulting work for health care facilities.

Earnings and Working Conditions

The salaries of medical record administrators are influenced by the location, size, and type of employing institution, as well as by the duties and responsibilities of the position. The average starting salary for medical record administrators in 1974 was $10,368 a year, according to a national survey conducted by the University of Texas Medical Branch at Galveston. Top salaries averaged $12,840 a year, with some earning as much as $18,792.

Newly graduated medical record administrators employed by the Federal Government generally started at $8,500 a year in late 1974; those having bachelor's degrees and good academic records were eligible to begin at $10,520. Some experienced medical record administrators employed by the Federal Government earned as much as $23,998 annually.

Medical record administrators usually work a regular 36- to 40-hour week and receive paid holidays and vacations.

Sources of Additional Information

Information about approved schools and employment opportunities is available from:

The American Medical Record Association, 875 N. Michigan Ave., Suite 1850, John Hancock Center, Chicago, Ill. 60611.

PHARMACISTS

(D.O.T. 074.181)

Nature of the Work

Pharmacists dispense drugs and medicines prescribed by medical practitioners and supply and advise people on the use of many medicines that can be obtained with and without prescriptions. Pharmacists must understand the use, composition, and effect of drugs and be able to test them for purity and strength. They also advise physicians on the proper selection and use of medicines. Compounding—the actual mixing of ingredients to form powders, tablets, capsules, ointments, and solutions—is now only a small part of pharmacists' practice, since most medicines are produced by manufacturers in the form used by the patient.

Many pharmacists employed in community pharmacies also have other duties. Besides dispensing medicines, some pharmacists buy and sell nonpharmaceutical merchandise, hire and supervise personnel, and oversee the general operation of the pharmacy. Other pharmacists, however, operate prescription pharmacies that dispense only medicines, medical supplies, and health accessories.

Pharmacists in hospitals and clinics dispense prescriptions and advise the medical staff on the selection and effects of drugs; they also make sterile solutions, buy medical supplies, teach in schools of nursing and allied health professions, and perform administrative duties. An increasing number of hospital pharmacists work as consultants to the medical team in matters related to daily patient care.

Some pharmacists, employed as medical sales representatives by drug manufacturers and wholesalers, sell medicines to retail pharmacies and to hospitals, and inform health personnel about new drugs. Others teach in pharmacy colleges, supervise the manufacture of pharmaceuticals, or develop new medicines. Some pharmacists also edit or write articles for pharmaceutical journals, or do administrative work.

Places of Employment

About 117,000 persons worked as licensed pharmacists in 1974; more than 10 percent were women. About 96,000 pharmacists worked in community pharmacies. Of these community pharmacists, more than two-fifths owned their own pharmacies; the others were salaried employees. Most of the remaining salaried pharmacists worked for hospitals, pharmaceutical manufacturers, and wholesalers. Some were civilian employees of the Federal Government, working chiefly in hospitals and clinics of the Veterans Administration and the U.S. Public Health Service. Others served as pharmacists in the Armed Forces, taught in colleges of pharmacy, or worked for State and local government agencies.

Most towns have at least one pharmacy with one pharmacist or more in attendance. Most pharmacists, however, practice in or near cities, and in those States which have the largest populations.

Training, Other Qualifications, and Advancement

A license to practice pharmacy is required in all States and the District of Columbia. To obtain a license, one must be a graduate of an accredited pharmacy college, pass a State board examination and—in nearly all States—have a specified amount of practical experience or internship under the supervision of a registered pharmacist. All States except California, Florida, and Hawaii grant a license

without examination to qualified pharmacists already licensed by another State.

At least 5 years of study beyond high school are required to graduate from one of the 73 accredited colleges of pharmacy and receive a Bachelor of Science (B.S.) or a Bachelor of Pharmacy (B. Pharm.) degree. A few colleges that require 6 years award a Doctor of Pharmacy (Pharm. D.) degree at the completion of the program. A few colleges admit students directly from high school and offer all the education necessary for graduation. Most colleges provide 3 or 4 years of professional instruction and require all entrants to have completed their prepharmacy education in an accredited junior college, college, or university.

A prepharmacy curriculum usually emphasizes mathematics and basic sciences, such as chemistry and biology, but also includes courses in the humanities and social sciences. Because entry requirements vary among colleges of pharmacy, prepharmacy students should inquire about and follow the curriculum required by colleges they plan to attend.

The bachelor's degree in pharmacy is the minimum educational qualification for most positions in the profession. However, a master's or doctor's degree in pharmacy or a related field usually is required for research work or college teaching. Areas of special study include pharmaceutics, pharmaceutical chemistry, pharmacology (study of the effects of drugs on the body), pharmacognosy (study of the drugs derived from plant or animal sources), clinical pharmacy, and pharmacy administration.

A limited number of Federal loans are available for students studying full-time toward a degree in pharmacy. Several scholarships also are awarded annually by drug manufacturers, chain drugstores, corporations, State and national pharmacy associations, and the colleges of pharmacy.

Since many pharmacists are self-employed, prospective pharmacists should have some business ability, as well as an interest in medical science and the ability to gain the confidence of customers. Honesty, integrity, and orderliness are important attributes for the profession. In addition, accuracy is needed to compound and dispense medicines as well as keep records required by law.

Pharmacists often begin as employees in community pharmacies. After they gain experience and obtain the necessary funds they may become owners or part-owners of pharmacies. A pharmacist who gains experience in a chain drugstore may advance to a managerial position, and later to a higher executive position within the company. Hospital pharmacists who have the necessary training and experience may advance to director of pharmacy service or to other administrative positions.

Employment Outlook

The employment outlook for pharmacists is expected to be very good through the mid-1980's. Growth of the occupation is expected to be about as fast as the average for all occupations. Most openings, however, will result from the death and retirement of persons already in the profession. Overall, job openings are expected to exceed the number of graduates of pharmacy schools.

Employment in the occupation will grow as new pharmacies are established, particularly in residential areas or suburban shopping centers. Many community pharmacies, also, are expected to hire additional pharmacists, because of a trend towards shorter working hours. Population growth, the rising standard of medical care, and the growth of Medicaid and other insurance programs that provide payment for prescription drugs also will generate demand for pharmacists.

Employment in hospitals probably will rise with the more extensive use of pharmacists for hospital and clinic work. Continued expansion in the manufacture of pharmaceutical products and in research are expected to provide more opportunities for pharmacists in production, research, distribution, and sales. Pharmacists with advanced training will be needed for college teaching and laboratory research.

Earnings and Working Conditions

Earnings of pharmacists employed in chain drugstores averaged about $17,000 in 1974, according to a survey conducted by the National Association of Chain Drug Stores. Pharmacists who are owners or managers of pharmacies often earn more. The minimum entrance salary in the Federal Government for new graduates was about $12,800 a year, in late 1974. With a master's degree or 2 years of graduate studies, the beginning salary was about $15,500. The average salary for all federally employed pharmacists was $18,061.

Annual starting salaries for hospital pharmacists were about $13,150 in 1974, according to a survey conducted by the University of Texas Medical School. Top salaries for experienced hospital pharmacists averaged $15,700, and some were as high as $22,900.

Community pharmacists generally work more than the standard 40-hour workweek. Pharmacies often are open in the evenings and on weekends, and all States require a registered pharmacist to be in attendance during store hours. Despite the general trend toward shorter hours, 44 hours is still the basic workweek for many salaried pharmacists, and some work 50 hours or more. Self-employed pharmacists often work more hours than those in

salaried positions. Those who teach or work for industry, government agencies, or hospitals have shorter workweeks.

Sources of Additional Information

A free packet giving information on pharmacy as a career, preprofessional requirements, and student financial aid is available from:

American Association of Colleges of Pharmacy, Office of Student Affairs, 4630 Montgomery Ave., Suite 201, Bethesda, Md. 20014.

General information on pharmacy is available from:

American Pharmaceutical Association, 2215 Constitution Ave. NW., Washington, D.C. 20037.

Information about chain drugstores is available from:

National Association of Chain Drug Stores, 1911 Jefferson Highway, Arlington, Va. 22202.

For information about retail pharmacies, contact:

American Council on Pharmaceutical Education, 77 W. Washington St., Chicago, Ill. 60602.

Information on requirements for licensure in a particular State is available from the Board of Pharmacy of that State or from:

National Association of Boards of Pharmacy, 77 W. Washington St., Chicago, Ill. 60602.

Information on college entrance requirements, curriculums, and financial aid is available from the dean of any college of pharmacy.

SOCIAL SCIENTISTS

Social scientists study all aspects of human society—from the origins of man to the latest election returns. However, they generally specialize in one major field of human relationships. Anthropologists study primitive tribes, reconstruct civilizations of the past, and analyze the physical characteristics, cultures and languages of all peoples, past and present. Economists study the allocation of land, labor, and capital. Geographers study the distribution of people throughout the world, types of land and water masses, and natural resources. Historians describe and interpret the people and events of the past and present. Political scientists study the theories, objectives, and organizations of all types of government. Psychologists study the normal and abnormal behavior of individuals and groups in order to understand and explain their actions. Sociologists analyze the behavior and relationships of groups—such as the family, the community, and minorities—to the individual or to society as a whole. Besides these basic social science occupations, a number of closely related fields are covered in separate statements elsewhere in this *Handbook*. (See statements on Statisticians, and Social Workers.)

The basic social science occupations provided employment for about 135,000 persons in 1974; over 10 percent of them were women. Overlapping among the basic social science fields and the sometimes hazy distinction between these and related fields such as business administration, foreign service work, and high school teaching, make it difficult to determine the exact size of each profession. Economists, however, are the largest social science group, and anthropologists the smallest.

About one-half of all social scientists work in colleges and universities. A large number work for the Federal Government and private industry. The trend in some industries is to hire increasing numbers of social science majors as trainees for administrative and executive positions. Research councils and other nonprofit organizations provide an important source of employment for economists, political scientists, and sociologists.

Overall employment in the social sciences is expected to grow faster than the average for all occupations through the mid-1980's. Economics is expected to be the fastest growing social science field. Teaching in colleges and universities will remain the major area of employment. Employment of social scientists in government, private industry, and nonprofit organizations is expected to rise also. Despite this anticipated growth, the number of persons seeking to enter the social science field is likely to exceed available job openings. The following statements present more detailed information about the prospective outlook in the individual occupations.

ANTHROPOLOGISTS

(D.O.T. 055.088 and 059.088)

Nature of the Work

Anthropologists study man—his origins, physical characteristics, and culture. These areas include a study of the people's traditions, beliefs, customs, languages, material possessions, social relationships, and value systems. Although anthropologists generally specialize in one of these four areas—cultural anthropology, archeology, linguistics, and physical anthropology—they are expected to have a general knowledge of all of them.

Most anthropologists specialize in cultural anthropology, sometimes called ethnology. *Ethnologists* may spend long periods living with tribal groups or in other communities to learn about their ways of life. The ethnologist takes detailed and comprehensive notes that describe the social customs, beliefs, and material possessions of the people. They usually learn the native language in the process. They also make comparative studies of the cultures and societies of various groups. In recent years, investigations have included complex urban societies.

Archeologists excavate places where people of past civilizations lived. They study the remains of homes, tools, clothing, ornaments, and other evidences of human life and activity to reconstruct the inhabitants' history and customs. For example, in a desert in New Mexico, archeologists uncovered an ancient kiva, an Indian religious chamber. In a cave by the Dead Sea, some have found pieces of an-

cient scrolls 2,000 years old. In the moors of England, other archeologists have continued to study the ancient monument called Stonehenge, a mysterious circle of huge stones. During the past few years, student archeological teams have excavated three large prehistoric communities along the Illinois River.

Some anthropologists specialize in *linguistics*, the scientific study of the sounds and structures of languages and of the historical relationships among languages. They study the relationship between the language and the behavior of people and assist in reconstructing the prehistory of mankind.

Physical anthropologists studying human evolution compare the physical characteristics of different races or groups of people as influenced by heredity and environment. This work requires extensive training in human anatomy and biology. A knowledge of body structure enables physical anthropologists to work occasionally as consultants on projects such as the design of cockpits for airplanes and spaceships, and the sizing of clothing. They are consulted on criminal cases and on projects to improve the environment. Increasingly, they are employed in medical schools.

Closely related to the four basic subfields is *applied anthropology*, an emerging specialty which uses the findings of other anthropologists in a practical manner. Applied cultural anthropologists may, for example, provide technical guidelines to ease the transition of nonindustrial societies to a more complex level of socioeconomic organization.

Applied linguistic anthropologists may produce technical and practical language information to encourage the advance of literacy in societies with unwritten languages. Another related specialty area is *urban anthropology*, which is the study of urban life, urbanization, rural-urban migration, and the influence of city life.

Most anthropologists teach in colleges and universities. They often combine teaching with research. Some anthropologists specialize in museum work, which generally combines managerial and administrative duties with fieldwork and research on anthropological collections. A few work as consultants or engage in nontechnical writing.

Places of Employment

About 3,800 persons—about one-fifth of them women—worked as anthropologists in 1974. About three-fourths of all anthropologists work in colleges and universities. Several hundred work in private industry and nonprofit organizations. The Federal Government employs a small number, chiefly in museums, national parks, in the Bureau of Indian Affairs, and in technical aid programs. State and local government agencies also employ anthropologists, usually for museum work or health research.

Training, Other Qualifications, and Advancement

Students who want to become anthropologists should obtain the Ph. D. degree. College graduates with bachelor's degrees often get temporary positions and assistantships in graduate departments where they are working for advanced degrees. A master's degree, plus field experience, is sufficient for many beginning professional positions, but promotion to top positions generally is reserved for individuals who have a Ph. D. degree. Many colleges and universities require a Ph. D. degree for permanent teaching appointments.

Mathematics is helpful, since statistical and computer methods are becoming more widely used for research in this field. Undergraduates may begin their field training in archeology by arranging, through their university departments, to accompany expeditions as laborers or to attend field schools established for training. They may later become supervisors in charge of the digging or collection of material and finally may direct a portion of the work of the expedition. Ethnologists and linguists usually do their fieldwork independently. Most anthropologists base their doctoral dissertations on data collected through field research; they are, therefore, experienced fieldworkers by the time they earn the Ph. D. degree.

Nearly 300 colleges and universities have bachelor's degree programs in anthropology; some 130 offer master's degree programs and about 80, doctoral programs. The choice of a graduate school is very important. Students interested in museum work should select a school which is associated with a museum that has anthropological collections. Similarly, those interested in archeology should choose either a university that offers opportunities for summer experience in archeological fieldwork, or attend an archeological field school elsewhere during summer vacations.

Anthropologists should have special interest in natural history and social studies and enjoy reading, research, and writing. Traveling to remote areas and working under difficulties are sometimes necessary for success.

Anthropologists work with ideas and have the opportunity for self-expression. They should be able to work independently and with detail.

Employment Outlook

The majority of new jobs are expected to be in private industry and in mental and public health and urban planning. College and university teaching, which will remain the largest area of employment for anthropologists, is likely to have little growth.

The number of qualified

anthropologists seeking to enter the field will likely exceed available positions. As a result, doctorate holders may face keen competition through the mid-1980's, particularly for jobs in colleges and universities. Graduates with only bachelor's and master's degrees are expected to face very keen competition. Some teaching positions may be available in junior colleges or some high schools for those who meet state certification requirements. In addition, the government and other organizations may hire personnel with social science training as a general background.

Earnings and Working Conditions

Starting salaries for anthropologists with a Ph. D. degree were generally about $13,000 a year in 1974. Experienced anthropologists earned median salaries of $17,500 a year, according to limited data available. They may, however, earn well over $20,000 a year. In general, salaries of experienced anthropologists are higher than the average for all nonsupervisory workers in private industry, except farming.

In the Federal Government, anthropologists having a bachelor's degree could begin as trainees at $8,500 or $10,520 a year in 1974, depending upon the applicant's academic record. Starting salaries for those having a master's degree were $12,841 a year, and for those having a Ph. D., $15,481. Anthropologists in the Federal Government averaged around $25,400 in late 1974.

Many anthropologists in colleges and universities supplement their regular salaries with earnings from other sources such as summer teaching and research grants.

Anthropologists sometimes are required to do fieldwork under adverse weather conditions. They also must adapt themselves to cultural environments which are materially and socially different.

Sources of Additional Information

For information about employment opportunities and schools that offer graduate training in anthropology, contact:

The American Anthropological Association, 1703 New Hampshire Ave. NW., Washington, D.C. 20009.

The Archeological Institute of America, 260 W. Broadway, New York, N.Y. 10013.

ECONOMISTS

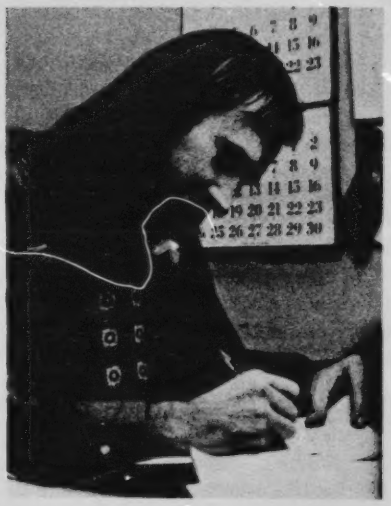
(D.O.T. 050.088 and .118)

Nature of the Work

Economists are concerned with how to utilize scarce resources such as land, raw materials, and human resources to provide goods and services for society. Economists analyze the relationship between the supply of goods and services on the one hand, and demand for them on the other, and how goods and services are produced, distributed, and consumed. Some economists are concerned with specific fields such as farm, wage, tax, and tariff problems and policies. Others develop theories to explain the causes of employment and unemployment or inflation. Most economists analyze and interpret a wide variety of economic data in the course of their work.

Economists who work in colleges and universities teach the theories, principles, and methods of economics and conduct or direct research. They frequently write, and act as consultants.

Economists in government collect and analyze data and prepare studies used to assess economic conditions and the need for changes in government policy. Most government economists are in the fields of agriculture, business, finance, labor, or international trade and development.



Economists who work for business firms provide management with information to make decisions on marketing and pricing of company products; the effect of government policies on business or international trade; or the advisability of adding new lines of merchandise, opening new branch operations, or otherwise expanding the company's business.

Places of Employment

Economics is the largest social science field. More than 71,000 persons, about 10 percent of them women, worked as economists in 1974. Private industry and business employ nearly three-fourths; colleges and universities about one-fifth. Others work for government agencies—mainly Federal—or for private research organizations. Some are self-employed.

Economists work in all large cities and university towns. The largest number are in the New York City and the Washington, D.C. metropolitan areas. Some work overseas, mainly for the U.S. Department of State including the Agency for International Development.

Training, Other Qualifications, and Advancement

Economists must have a thorough understanding of economic theory and of mathematical methods of economic analysis. Since many beginning jobs for economists in government and business involve the collection and compilation of data, a thorough knowledge of basic statistical procedures is required. In addition to courses in macroeconomics, microeconomics, econometrics, and statistics, training in computer science also is highly recommended.

Although a bachelor's degree with a major in economics is sufficient for many beginning research jobs, graduate training often is required for advancement to more responsible positions. In 1974, about one-half of those working as economists held either a master's or a Ph. D. degree. Students interested in graduate training in economics should select schools that provide good research facilities.

In the Federal Government, candidates for entrance positions must have a minimum of 21 semester hours of economics and 3 hours of statistics, accounting, or calculus.

A master's degree generally is required to get a job as a college instructor in many junior colleges and small 4-year schools. In many large colleges and universities, completion of all the requirements for a Ph. D. degree, except the dissertation, is necessary for appointment as a teaching assistant. In government or private industry, economists who have a master's degree usually can qualify for more responsible research positions.

The Ph. D. degree is required for a professorship in a highranking college or university and is an asset when competing for other responsible positions in government, business, or private research organizations.

About 750 colleges and universities offer bachelor's degree programs in economics; 200, master's; and over 100, doctoral programs.

Persons who consider careers as economists should be able to work accurately and in detail since much time is spent on research. Frequently, the ability to work as part of a team is required. Economists must be objective in their work and be able to express themselves effectively orally and in writing.

Employment Outlook

The number of persons who will graduate with bachelor's degrees in economics through the mid-1980's is likely to exceed available positions. Although many of these degree holders may find employment in government, industry, and business as trainees or management interns, competition may be keen. Candidates who hold graduate degrees also may face strong competition for positions in colleges and universities, although they should find good opportunities in private industry and government. Economists with training in computer applications should be in particular demand as well as Ph. D.'s working on tax, pollution, and government policy problems of business and industry.

Private industry and business will continue to provide the largest number of employment opportunities for economists because of increased reliance on quantitative methods of analyzing business trends, forecasting sales, and planning purchases and production operations. The next largest area of employment opportunities for economists will be in colleges and universities, although a projected decrease in enrollments is likely to affect growth in faculty size. Employment of economists in State and local government agencies is expected to increase rapidly because of the growing responsibilities of local governments in areas such as housing, mass transportation, and manpower development and training. Employment of economists in the Federal Government is expected to rise slowly—in line with the rate of growth projected for the Federal work force as a whole.

Earnings

Starting salaries for economists with a Ph. D. were about $13,000 a year in 1974, according to limited information. Salaries of economists employed by colleges and universities in 1974 averaged about $22,000, and for those in business, industry, and nonprofit organizations, about $24,000. Economists who have a Ph. D. are paid higher salaries than those who have lesser degrees and similar experience. A substantial number of economists supplement their basic salaries by consulting, teaching, and other research activities. In general, salaries of experienced economists are much higher than the average for all nonsupervisory workers in private industry, except farming.

In the Federal Government, the entrance salary for beginning economists having a bachelor's degree was $8,500 a year in 1974; however, those with superior academic records could begin at $10,520. Those having a master's degree could qualify for positions at an annual salary of $12,841, while those with a Ph. D. could begin at $15,481. Economists in the Federal Government averaged around $24,700 in late 1974.

Sources of Additional Information

Additional information on a career as an economist is available from:

American Economic Association, 1313 21st Avenue South, Nashville, Tenn. 37212.

GEOGRAPHERS

(D.O.T. 017.281, 029.088, and 059.088)

Nature of the Work

Geographers study the spatial characteristics of the earth—and all that is found on it. Such studies help to explain changing patterns of human settlement—where people live, why they are located there, and how they earn a living.

Most geographers are college or university teachers; some combine teaching and research. Their research includes the study and analysis of the distribution of land forms, climate, soils, vegetation, mineral, water, and human resources. They also analyze the distribution and structure of political organizations, transportation systems, marketing systems, urban systems, agriculture, and industry. Many geographers spend considerable time in field study, and in analyzing maps, aerial photographs, and observational data collected. Sometimes they use surveying and meteorological instruments. Photographs and other data from remote sensors on satellites are used increasingly as are modern statistical techniques. Other geographers construct maps, graphs, and diagrams.

Most geographers specialize in one branch or more of geography. *Economic geographers* deal with the geographic distribution of economic activities—including manufacturing, mining, farming, trade, and communications. *Political geographers* study the relationship of geographic conditions to political processes. *Urban geographers* study cities and their problems and make decisions about city development and community planning. (See statement on Urban Planners elsewhere in the *Handbook*.) *Physical geographers* study the physical characteristics and processes affecting the earth. They typically specialize in a particular branch of physical geography such as hydrology or geomorphology. *Regional geographers* study the physical, economic, political, and cultural characteristics of a particular region or area, which may range in size from a river basin or an island, to a State, a country, or even a continent. *Cartographers* compile data and design and construct maps.

Many geographers have job titles such as cartographer, map analyst, or regional planner, that describe their specialization. Others have titles that relate to the subject matter of their study such as photo-intelligence specialist or climatological analyst. Still others have titles such as community or environmental planner, or market or business analyst.

Places of Employment

About 9,000 persons worked as geographers in 1974; about 15 percent were women.

Colleges and universities employ more than two-thirds of all geographers. The Federal Government employs a large number, mostly in the Washington, D.C. area. Among Federal agencies, the Department of Defense employs the largest number in such agencies as the Defense Mapping Agency, Naval Intelligence, and the Defense Intelligence Agency. The Commerce Department employs geographers in such agencies as the Bureau of the Census, Office of Regional Commissions, National Oceanic and Atmospheric Administration and National Weather Service. Geographers employed by the Interior Department work in such agencies as the Bureau of Indian Affairs, Bureau of Outdoor Recrea-

tion, and Bureau of Land Management and Geological Survey. Other Government agencies that employ geographers include the Central Intelligence Agency (CIA), Office of Emergency Preparedness, National Aeronautical and Space Administration (NASA), and the Library of Congress.

State and local governments also employ small numbers of geographers, mostly on city and State planning and development commissions.

A small but growing number of geographers work in private industry. Most work in research divisions of textbook and map publishers, travel agencies, manufacturing firms, or chain stores. Others work for scientific foundations and research institutes.

Training, Other Qualifications, and Advancement

The educational requirement for beginning positions in geography is usually a bachelor's degree with a major in the field. Bachelor's degree holders would find it helpful to have training in a specialty such as cartography or economic geography.

A master's degree is usually required for the position of college instructor. In many colleges and universities, however, a Ph. D. degree is essential for high-level teaching, research, and administrative positions.

About 400 colleges and universities offered degree training in geography in 1974. Undergraduate study provides a general introduction to geographic knowledge and research methods and often includes some field studies. Typical courses offered are physical and cultural geography, weather and climate, economic geography, political geography, urban geography and quantitative methods in geography. Courses in cartography and in the interpretation of maps and aerial and satellite photographs also are offered.

In 1974, 115 institutions offered master's degree programs; 54 offered Ph. D. programs. Applicants are required to have a bachelor's degree in any of the social or physical sciences with some background in geography. Requirements for advanced degrees include field and laboratory work as well as advanced classroom studies in geography and thesis preparation. Many graduate schools also require course work in advanced mathematics and computer science because of the increasing emphasis on these areas in the field. A language is required for those students who plan to enter the field of foreign regional geography.

Persons who want to become geographers should enjoy reading, studying, and research because they must keep abreast of developments in the field. Geographers must work with abstract ideas and theories as well as do practical studies. They also must be able to work independently and communicate their ideas orally and in writing.

Employment Outlook

Employment of geographers is expected to grow faster than the average for all occupations through the mid-1980's. However, growth in college and university teaching, which will remain the largest area of employment for geographers, is likely to be slow. Many opportunities are becoming available in the field of environmental management and planning. The Federal Government will need additional personnel to work in programs such as regional development, environmental quality, and intelligence. Employment of geographers in State and local government is expected to expand, particularly in areas such as conservation, environmental quality, highway planning, and city, community, and regional planning and development. Private industry also is expected to employ increasing numbers of geographers for market research and location analysis.

The employment outlook for geographers with the Ph. D. is expected to be favorable through the mid-1980's for positions in research and teaching in colleges and universities and for research jobs in industry and government. Those with the master's degree are likely to face competition for choice academic positions; however, expanding geography programs in junior colleges should provide some jobs.

Graduates who have only the bachelor's degree in geography may find positions connected with making, interpreting, or analyzing maps; or in research either working for government or industry. Others may obtain employment as research or teaching assistants in educational institutions while studying for advanced degrees. Some bachelor's degree holders do teach at the high school level, although in some States, the master's degree is becoming essential for high school teaching positions. Others earn library science degrees and become map librarians.

Earnings and Working Conditions

Salaries of geographers in colleges and universities depend on their teaching rank and experience. Assistant professors entering the field with a Ph. D. and no experience started at between $11,000 and $12,000 in 1974, according to limited information. Nearly three-fourths of all geographers earned between $12,000 and $24,000 a year, according to a recent survey conducted by the Association of American Geographers. About one-fourth earned between $22,000 and $27,000, and a few, more than $27,000. Geographers in educational institutions usually have an opportunity to earn income from other sources, such as consulting work, special research, and publication of books and articles.

Geographers in the Federal Government with the bachelor's degree and no experience started at $8,500 or $10,520 a year in 1974, depending on their college records. Those with a master's degree started at $12,841 a year, and those with the Ph. D. at $15,481. Geographers in the Federal Government averaged around $22,200 in late 1974.

In general, salaries of experienced geographers are higher than the average for all nonsupervisory workers in private industry, except farming.

Sources of Additional Information

Additional information on a career as a geographer is available from:

Association of American Geographers, 1710 16th St. NW., Washington, D.C. 20009.

HISTORIANS

(D.O.T. 052.038 and .088)

Nature of the Work

History is the record of past events, institutions, ideas, and people. Historians describe and analyze the past through writing, teaching, and research. They relate their knowledge of the past to current events in an effort to explain the present.

Historians may specialize in the history of a specific country or area, or in a particular period of time—ancient, medieval, or modern. They also may specialize in the history of a field, such as economics, culture, military affairs, the labor movement, art, or architecture.

The number of specialties in history is constantly growing. Newer specialties are concerned with business archives, quantitative analysis, and the relationship between technological and other aspects of historical development. In this country, most historians specialize in the social or political history of either the United States or modern Europe; however, a growing number now specialize in African, Latin American, Asian, or Near Eastern history. Some historians specialize in phases of a larger historical field, such as the American Civil War.

Most historians are college teachers who, outside the classroom, lecture, write, and do research. Some are specialists called *archivists*, who are associated with museums, special libraries, and historical societies. A few serve as consultants to editors, publishers, and producers of materials for radio, television, and motion pictures. Some historians are administrators in government or researchers who prepare studies, articles, and books on their findings.

Places of Employment

About 26,000 people worked as professional historians in 1974; more than 13 percent were women. Colleges and universities employ about two-thirds of all historians. Historians also work in archives, libraries, museums, junior colleges, secondary schools, research and editing organizations, and Government. Historians employed in the Federal Government work principally in the National Archives, or in the Departments of Defense, Interior, and State. A small but growing number work for State and local governments.

Since history is taught in all U.S. institutions of higher education, many historians are found in college communities. Many historians in the Federal Government are employed in Washington, D. C. Historians in other types of employment usually work in localities having museums or libraries with collections adequate for historical research.

Training, Other Qualifications, and Advancement

Graduate education usually is necessary for employment as a historian. A master's degree in history is the minimum requirement for the position of college instructor. In many colleges and universities, however, a Ph. D. degree is essential for high-level teaching, research, and administrative positions. Most historians in the Federal Government and in nonprofit organizations have Ph. D. degrees, or their equivalent in training and experience.

Although the combination of the bachelor's degree and a major in history is sufficient training for some beginning jobs in government— either Federal, State, or local—people in such jobs may face limited advancement opportunities. A knowledge of archival work is helpful, since beginning jobs are likely to be concerned with collection and preservation of historical data. For some jobs in international relations and journalism an undergraduate major in history is considered helpful.

Training for historians is available in many colleges and universities. Over 1,100 schools offer programs for the bachelor's degree; about 380, the master's; and about 130, doctorates.

History curriculums in the Nation's colleges and universities are

varied; however, each basically provides, in addition to history topics, training in research methods, writing, and speaking. These are the basic skills essential for historians in all positions. Quantitative methods of analysis, including computer techniques, are increasingly important for historians; many college programs include them.

Historians spend a great deal of time studying, doing research, writing papers and reports, and giving lectures and presentations. In order to do these things well, they must be capable of communicating their ideas effectively, orally and in writing. The ability to work both independently and as part of a group is essential.

Employment Outlook

Employment of historians is expected to grow about as fast as the average for all occupations through the mid-1980's. Historians will be needed to fill positions in colleges and universities, junior colleges, libraries, archives, museums, secondary schools, research and editorial organizations, and government. Demand also will be strong for people with training in historical specialties such as business history, as well as those who use quantitative methods in their research. In addition to jobs created by growth of the field, an even larger number of openings for historians each year over the projected period is expected to result from the need to replace those who retire, die, or leave the profession.

Although information is limited on patterns of entry to the field, the number of persons seeking to enter the occupation will probably exceed available positions. As a result, historians who have a Ph. D. are expected to face keen competition for the more desirable positions through the mid-1980's, especially for jobs in the academic community. Historians having only the master's degree will encounter very keen competition for jobs, but some teaching positions may be available in junior colleges or some high schools for those who meet State certification requirements. People having only a bachelor's degree in history may find limited opportunities as professional historians.

Earnings

Starting salaries for historians having a doctorate averaged around $13,000 a year in 1974, according to limited information; master's degree holders had average starting salaries of around $11,000 a year.

Salaries of historians in educational institutions averaged over $18,000 in 1974; in State and local governments, over $14,000; in nonprofit organizations, nearly $18,000; and in private industry, nearly $20,000 a year. The annual median salary for historians was around $15,500 in 1974. In general, salaries of experienced historians are higher than the average for all nonsupervisory workers in private industry, except farming.

In the Federal Government, historians having a bachelor's degree could start at $8,500 or $10,520 a year in 1974, depending upon the applicant's academic record. Starting salaries for those having a master's degree were $12,841 a year, and for those having a Ph. D., $15,481. Historians in the Federal Government averaged around $22,800 a year in late 1974.

Many historians, particularly those in college teaching, supplement their income by summer teaching or writing books or articles. A few earn additional income from lectures.

Sources of Additional Information

Additional information on employment opportunities for historians is available from:

American Historical Association, 400 A St. SE., Washington, D.C. 20003.

POLITICAL SCIENTISTS

(D.O.T. 051.088)

Nature of the Work

Political scientists study the functions and workings of governments. Many of them specialize in a general area of political science including political theory, U.S. political institutions and processes, comparative political institutions and processes, or international relations and organizations. Some specialize in a particular type of political institution or in the politics of a specific era.

Most political scientists teach in colleges and universities where they combine research, consultation, or administrative duties with teaching. Some are primarily researchers who survey public opinion on political questions for private research organizations, or study proposed legislation for Federal, State, and municipal governments, legislative reference bureaus or congressional committees. Others analyze the operations of government agencies, specialize in foreign affairs, or do research for either government or nongovernment organizations. Some administer government programs.

Places of Employment

About 11,500 persons worked as political scientists in 1974; 10 percent were women. About four-fifths work in colleges and universities. Most of the remainder work in government, research bureaus, civic and taxpayers associations, and large business firms.

Political scientists can be found in nearly every college or university town since courses in government and political science are taught in almost all institutions of higher education. Some work overseas primarily for agencies of the U.S. Department of State, such as the Foreign Service, and the U.S. Agency for International Development.

A political scientist explains the results of a public opinion survey.

They also work for the U.S. Information Agency.

Training, Other Qualifications, and Advancement

Graduate training generally is required for employment as a political scientist. Completion of the requirements for the Ph. D. degree, except the doctoral dissertation, is the usual prerequisite for appointment as a college instructor. A Ph. D. degree is required for advancement to the position of assistant professor. The Ph. D. also is helpful for advancement in nonacademic areas.

College graduates having a master's degree can qualify for various administrative and research positions in government and in nonprofit research or civic organizations. A master's degree in international relations, foreign service, or area study (for example, Soviet Government) is helpful in obtaining positions in Federal Government agencies concerned with foreign affairs.

People with only a bachelor's degree in political science may qualify as trainees in public relations, research, budget analysis, personnel, or investigation fields. Many students with bachelor's degrees in political science go on to study law or some specialized or related branch of political science, such as public administration and international relations.

In 1974, about 760 colleges and universities offered a bachelor's degree in political science, 270 had master's programs, and 113 had doctoral programs. Many colleges and universities offer field training and internships to gain experience in government work.

Undergraduate programs in political science vary throughout the Nation. A typical undergraduate curriculum in political science includes introductory politics, State and urban politics, comparative studies, political theory, foreign policy, and public administration. An increasing number have courses in quantitative and statistical methods including the use of computers because of increased research emphasis in the field.

Persons planning careers as political scientists should like to work with details. They must be objective and able to work independently or as part of a team. Ability to express themselves clearly, orally and in writing, is important to political scientists.

Employment Outlook

The number of persons who will graduate with advanced degrees in political science is likely to exceed available job openings. Those having a Ph. D. may face stiff competition finding choice academic positions. Master's degree holders may face very keen competition finding positions as college and university instructors, but those having specialized training in areas such as policy analysis or public administration should have some opportunities in Federal, State and local government, research bureaus, political organizations and welfare agencies. New graduates having only the bachelor's degree are expected to find very limited opportunities. However, for those planning to continue their studies in law, foreign affairs, journalism, and other related fields, a political science background is very helpful. Some who meet State certification requirements will be able to enter high school teaching.

Employment of political scientists is expected to increase about as fast as the average for all occupations through the mid-1980's. The largest area of employment will continue to be in college and university teaching. In addition to those required to staff new posi-

tions, political scientists will be needed to fill positions vacated due to retirements, death or transfers.

Earnings

The median annual salaries of political scientists employed in educational institutions in 1973-74 were: $19,500 for full professors; $15,000 for associate professors; $12,500 for assistant professors; and $10,500 for instructors. In general, salaries of experienced political scientists are higher than the average for all nonsupervisory workers in private industry, except farming.

In the Federal Government, the entrance salary for those having a bachelor's degree was $8,500 or $10,520 a year in late 1974, depending upon the applicant's academic record. Starting salaries for those having a master's degree were $12,841 a year, and for those having a Ph. D., $15,481. Political scientists in the Federal Government averaged around $26,200 in late 1974.

Some political scientists, particularly those in college teaching, supplement their income by teaching summer courses or consulting.

Sources of Additional Information

Additional information on employment opportunities in political science and public administration is available from:

American Political Science Association, 1527 New Hampshire Ave. NW., Washington, D.C. 20036.

PSYCHOLOGISTS

(D.O.T. 045.088 and .108)

Nature of the Work

Psychologists study the normal and abnormal behavior of individuals and groups in order to understand and explain their actions. In the course of their work, they may be concerned with the problems of emotional stress and abnormal behavior, the causes of low morale, or the effective performance of an astronaut. Some teach in colleges and universities; others provide counseling services, plan and conduct training programs for workers, conduct research, advise on psychological methods and theories, or administer psychology programs in hospitals, clinics, or research laboratories. Many psychologists combine several of these activities.

Psychologists gather information about the capacities, interests, and behavior of people in various ways. They interview individuals, develop and administer tests and rating scales, study personal histories, and conduct controlled experiments. Also, psychologists often design and conduct surveys.

Areas of specialization in psychology include *experimental psychology*—in which behavior processes are studied in the laboratory; *developmental psychology*—the study of the causes of behavioral changes as people progress through life; *personality*—the study of the processes by which a person becomes a unique individual; *social psychology*—in which people's interactions with others and with the social environment are examined; *educational and school psychology*—which are concerned with the psychological factors related to the process of education; *comparative psychology*—in which the behavior of different

A psychologist (right) observes an infant with its mother as part of a psychological study.

animals, including man, is compared; *physiological psychology*—the study of the relationship of behavior to the biological functions of the body; and *psychometrics*—the development and application of procedures for measuring psychological variables.

Psychologists often combine several areas of psychology in their specialty. *Clinical psychologists* are the largest group of specialists. They generally work in mental hospitals or clinics, and are involved mainly with problems of mentally or emotionally disturbed people. Clinical psychologists may also deal with the emotional impact of injury or disease, helping the client to readjust to life with altered physical capabilities. They interview patients, give diagnostic tests, provide individual, family, and group psychotherapy, and design and carry through behavior modification programs. *Counseling psychologists* help people with important problems of everyday living. In their work, they may use any of a number of counseling techniques. Other combined fields are *industrial and organizational psychology* where problems of motivation and morale in work situations are studied; *engineering psychology*, the development and improvement of man-machine systems; *consumer psychology*, the study of the psychological factors that determine an individual's behavior as a consumer of goods and services; and *environmental psychology*, the relationships between individuals and their environment.

Places of Employment

About 75,000 people, two-fifths of them women, worked as psychologists in 1974. More than 40 percent of the total work in colleges and universities, either as teachers, researchers, or counselors. The second largest group of psychologists work for Federal, State, and local government agencies. Federal agencies that employ the most psychologists are the Veterans Administration, the Department of Defense, and the Public Health Service.

Many psychologists work in public schools, clinics, hospitals, medical schools, and for business or industry. Some are in independent practice, and others serve as commissioned officers in the Armed Forces and the Public Health Service.

Training, Other Qualifications, and Advancement

Generally, a master's degree in psychology is the minimum educational requirement for professional employment in the field. People who have this degree can qualify for positions where they administer and interpret psychological tests, collect and analyze statistical data, conduct research experiments, and perform administrative duties. They also may teach in colleges, counsel students or handicapped persons, or—if they have had previous teaching experience—work as school psychologists or counselors. (See statements on School Counselors and Rehabilitation Counselors.)

A Ph. D. degree is needed for many entrance positions and is becoming increasingly important for advancement. People who have doctorates in psychology qualify for the more responsible research, clinical, and counseling positions, as well as for the higher level positions in colleges and universities and in Federal and State programs.

At least 1 year of full-time graduate study is needed to earn a master's degree in psychology. An additional 3 to 5 years of graduate work usually are required for a Ph. D. In clinical or counseling psychology, the requirements for the Ph. D. degree generally include an additional year of internship or supervised experience.

Some universities require applicants for graduate work in psychology to have had an undergraduate major in that field. Others prefer broader educational backgrounds that include not only some basic psychology but also courses in the biological, physical, and social sciences, statistics, and mathematics. Competition for acceptance into graduate psychology programs is expected to be strong. Only the most highly qualified applicants can expect to be admitted to graduate study.

Many graduate students receive financial help in the form of fellowships, scholarships, or part-time employment from universities and other sources. Several Federal agencies provide funds to graduate students, generally through the college or university that provides the training. The Veterans Administration offers a number of predoctoral traineeships which provide payments to students while they gain supervised experience in VA hospitals and clinics. The National Science Foundation, the U.S. Office of Education, the Public Health Service, the Rehabilitation Services Administration, and the National Institute of Mental Health also provide fellowships, grants, and loans for advanced training in psychology. However, the present trend at the Federal level is toward providing low-interest loans rather than fellowships and grants.

The American Board of Professional Psychology awards diplomas in clinical, counseling, industrial, and school psychology to those who have outstanding educational records and experience and who pass the required examinations.

Psychologists who want to enter independent practice must meet certification or licensing requirements in an increasing number of States. In 1974, 47 States and the District of Columbia had these requirements.

People pursuing a career in psychology must be emotionally

stable, mature, and able to deal effectively with people. Sensitivity, patience, and a genuine interest in others are particularly important for work in clinical and counseling psychology. Research psychologists should be able to do detailed and independent work; verbal and writing skills are necessary to communicate research findings.

Employment Outlook

Employment opportunities for psychologists are expected to be generally favorable through the mid-1980's. Opportunities should be very good for Ph. D.'s and for some master's degree holders, especially those specializing in clinical or counseling psychology. However, as more and more people become trained in psychology, competition for jobs will grow. A doctorate degree will become increasingly important for those wishing to enter the field.

Employment of clinical, counseling, and social psychologists in mental hospitals, correctional institutions, mental hygiene clinics, and community health centers is expected to expand rapidly. Many openings for psychologists also are anticipated in the Federal Government, primarily in the Veterans Administration and the Department of Defense.

Psychologists may find strong competition for job openings in large colleges and universities, which are preferred locations for many specialties in psychology. However, those willing to work in the relatively smaller and newer publicly supported institutions should have better employment prospects. The growth in enrollment in 2-year colleges also will create new teaching positions for psychologists.

Several other factors should help maintain a strong demand for psychologists. Growing awareness of the need for testing and counseling children is expected to increase the need for psychologists in schools. Increased public concern for the development of human resources will further increase the demand. The inclusion of psychological services in any national health insurance legislation also should improve employment prospects. Other openings may occur as psychologists move into new fields of employment where their services are beginning to be recognized as useful. Government agencies are also making increased use of the services which psychologists can provide. Also, many vacancies will occur each year as a result of retirements and deaths.

Earnings and Working Conditions

In 1974, starting salaries for psychologists holding a master's degree averaged about $11,000 a year, according to the American Psychological Association. Beginning salaries for those holding a doctorate averaged $13,000.

Median salaries of psychologists teaching in graduate departments ranged from about $13,000 for assistant professors to $21,600 for full professors during the academic year 1974-75 (9-10 months), according to a survey conducted by the American Psychological Association.

In the Federal Government, psychologists having a Ph. D. degree and 1 year of internship started at $15,481 a year in late 1974. With 1 year of experience, Ph. D.'s earned $18,463, and with 2 years, $21,816. The average salary for Ph. D. psychologists in the Veterans Administration was about $24,700 a year. The median salary for a Ph. D. psychologist working in a clinic or hospital was about $19,000. Ph. D. psychologists in private practice generally have considerably higher earnings than those in other settings. Median annual income for those psychologists (working full time) is over $32,000. In general, psychologists earn over twice as much as the average nonsupervisory worker in private industry, except farming.

Working conditions for psychologists who teach in colleges and universities are the same as for other faculty members. Most colleges provide for sabbatical leaves of absence, life and health insurance, and retirement plans. Working hours are generally flexible, but often entail some evening work with individual students or groups. Clinical and counseling psychologists often work in the evenings since their patients sometimes are unable to leave their jobs or school during the day.

Sources of Additional Information

For general information on career opportunities, certification or licensure requirements, and educational facilities and financial assistance for graduate students in psychology, contact:

American Psychological Association, 1200 17th St. NW., Washington, D.C. 20036.

Information on traineeships and fellowships is available from colleges and universities that have graduate psychology departments.

SOCIOLOGISTS

(D.O.T. 054.088)

Nature of the Work

Sociologists study the groups that man forms in his association with others. These groups include families, tribes, communities, and governments, along with a variety of social, religious, political, business, and other organizations. They study their behavior and interaction; trace their origin and growth; and analyze the influence of group activities on individual members.

Some sociologists concern themselves primarily with the characteristics of social groups and institu-

Sociologists frequently collaborate on research.

tions. Others are more interested in the ways individuals are affected by groups to which they belong.

Many sociologists specialize in social organization, social psychology, or rural sociology. Others specialize in intergroup relations, family problems, social effects of urban living, population studies, or analyses of public opinion. Some conduct surveys or concentrate on research methods. Growing numbers apply sociological knowledge and methods in penology and correction, education, public relations in industry, and regional and community planning. A few specialize in medical sociology—the study of social factors that affect mental and public health.

Most sociologists are college and university teachers whose duties include both teaching and research. Sociological research involves the collection of information, preparation of case studies, testing, and the conduct of statistical surveys and laboratory experiments.

Sociologists also supervise research projects or the operation of social agencies such as family and marriage clinics. Others, acting as consultants, advise on diverse problems such as the management of hospitals for the mentally ill, the rehabilitation of juvenile delinquents, or the development of effective advertising programs to promote public interest in particular products such as television sets or cars.

Places of Employment

About 14,000 persons worked as sociologists in 1974—one-fifth of them women.

Colleges and universities employ over four-fifths of all sociologists. A number work for Federal, State, local, or international government agencies, in private industry, or in welfare or other nonprofit organizations, or else are self-employed. Others work in positions that require training in this field but are not classified as professional sociologists. These fields include social, recreation, and public health work.

Since sociology is taught in most institutions of higher learning, sociologists may be found in nearly all college communities. They are most heavily concentrated, however, in large colleges and universities which offer graduate training in sociology and opportunities for research.

Training, Other Qualifications, and Advancement

A master's degree and a major in sociology usually is the minimum requirement for employment as a sociologist. The Ph. D. degree is essential for attaining a professorship in most colleges or universities. It also is commonly required for directors of major research projects, important administrative positions, or consultants.

Sociologists having master's degrees, who are trained in research and statistical and computer methods, can qualify for many administrative and research positions. Advancement to supervisory positions in both public and private agencies is gained through experience. Sociologists having a master's degree may qualify for some college instructorships. Most colleges, however, appoint as instructors only people who have training beyond the master's level—frequently the completion of all requirements for the Ph. D. degree except the doctoral dissertation. Outstanding graduate students often get teaching or research assistantships which provide both financial aid and valuable experience.

Bachelor's degree holders in

sociology may get jobs as interviewers or as research assistants. Many work as caseworkers, counselors, recreation workers, or administrative assistants in public and private welfare agencies. Sociology majors who have sufficient training in statistics may get positions as beginning statisticians. Those who meet State certification requirements can teach at a high school. About 900 colleges and universities offer bachelor degree programs in sociology; more than 200 offer master's degrees, and about 110 have doctoral programs.

The choice of a graduate school is important for people who want to become sociologists. Students interested in research should select schools that emphasize training in research, statistical, and computer methods. Opportunities to gain practical experience in research work also may be available. Professors and heads of sociology departments frequently aid in the placement of graduates.

Sociologists spend a great deal of their time in study and research. They must be able to communicate effectively, both orally and in writing. The ability to work as part of a group as well as independently is important.

Employment Outlook

The number of persons who will graduate with advanced degrees in sociology is likely to exceed available job openings. Those having a Ph. D. may face competition finding choice academic positions. Those having only a master's degree will probably continue to face considerable competition for academic positions, but some jobs will be available in government and private industry. Sociologists well trained in research methods, advanced statistics, and the use of computers will have the widest choice of jobs. Demand is expected to be strong for research personnel to work in the areas of rural sociology, community development, population analysis, public opinion research, medical sociology, and juvenile delinquency and education.

Employment of sociologists is expected to increase about as fast as the average for all occupations through the mid-1980's. Some openings will result from the growing trend to include sociology courses in the curriculums of other professions, such as medicine, law, and education. Demand in the nonteaching area will center around public and private programs dealing with the development of human resources, particularly those designed to cope with social and welfare problems. In addition to growth needs, several hundred openings will occur each year to replace sociologists who die, retire, or leave the field for other reasons.

Earnings and Working Conditions

In 1974, sociologists working in educational institutions on a calendar year basis averaged about $18,000. Those working in nonprofit organizations and private industry averaged around $17,500 and $20,000 a year, respectively. In general, salaries of experienced sociologists are higher than the average for all nonsupervisory workers in private industry, except farming.

In the Federal Government, the entrance salary for those having a bachelor's degree was $8,500 or $10,520 a year in 1974, depending upon the applicant's academic record. Starting salaries for those having a master's degree were $12,841 a year, and for those having a Ph. D., $15,481. Sociologists in the Federal Government averaged around $23,300 in late 1974.

In general, sociologists having the Ph. D. degree earn substantially higher salaries than those having master's degrees. Many sociologists, particularly those employed by colleges and universities for the academic year (September to June), are likely to supplement their regular salaries with earnings from other sources, such as summer teaching and consulting work.

Sources of Additional Information

Additional information on sociologists is available from:

The American Sociological Association, 1722 N St., NW., Washington, D.C. 20036.

SOCIAL SERVICE OCCUPATIONS

Workers in the social service occupations help to improve the lives of the population they serve by providing a wide range of information and services. Depending on their specific occupation, they may advise consumers on how to get the most for their money; help handicapped people to achieve satisfactory lifestyles; provide religious services; counsel people having problems in their job, home, school, or social relationships; or treat people having emotional problems.

Although social services are provided in many different settings, people in these occupations require many of the same skills. In general, a knowledge of the field is gained through formal education, and the ability to apply this knowledge is improved and refined through work experience.

A genuine concern for people and a desire to help them to improve their lives are important for anyone considering a career in the social service field. Patience, tact, sensitivity, and compassion are necessary personal qualities.

COUNSELING OCCUPATIONS

Counselors help people to understand themselves and their opportunities so that they can make and carry out decisions and plans for a satisfying and productive life. Whatever the area of counseling—personal, educational, or vocational—counselors must combine objectivity with genuine concern for each client. They must believe in the uniqueness and worth of each individual, in his right to make and accept responsibility for his own decisions, and in his potential for development.

This chapter covers four counseling specialties: school; rehabilitation; employment; and college career planning and placement.

School counselors are the largest counseling group. Their main concern is the personal and social development of students and helping them plan and achieve their educational and vocational goals.

Rehabilitation counselors work with persons who are physically, mentally, or socially handicapped. Their counseling is generally job-oriented, but also involves personal problems.

Employment counselors are mainly concerned with career planning and adjustment of young, old, disabled, and other persons.

College career planning and placement counselors help college students examine their own interests, abilities, and goals; explore career alternatives; and make and follow through with a career choice.

Persons who want to enter the counseling field must be interested in helping people and have an ability to understand their behavior. A pleasant but strong personality that instills confidence in clients is desirable. Counselors also must be patient, sensitive to the needs of others, and able to communicate orally as well as in writing.

Many psychologists, social workers, and college student personnel workers also do counseling. These and other fields which entail some counseling such as teaching, health, law, religion, and personnel, are described elsewhere in the *Handbook*.

SCHOOL COUNSELORS

(D.O.T. 045.108)

Nature of the Work

School counselors are concerned about the educational, career, and social development of students. They work with students, both individually and in groups, as well as with teachers, other school personnel, parents, and community agencies.

Counselors use the results of interest, achievement, and intelligence tests as well as school and other records to help students evaluate themselves. Then, with each student and sometimes with the parents, they help develop an educational plan that fits the student's abilities, interests, and career aspirations.

School counselors often maintain a small library containing occupational literature so that students may find descriptions of work that they have heard about or in which they have an interest. Information on training requirements, earnings, and employment outlook often is included with these job descriptions. Computers that students can use to look up this information themselves are being tried in some instances.

Counselors sometimes arrange trips to factories and business firms, and show vocational films to provide a view of real work settings. To bring the workplace into the school, the counselor may conduct "career day" programs.

School counselors must keep up-to-date on opportunities for educational and vocational training beyond high school to counsel students who want this information. They must keep informed about training programs in 2-and 4-year colleges; in trade, technical, and business schools; apprenticeship programs; and available federally supported programs. Counselors also advise students about educational requirements for entry level jobs, job changes caused by technological advances, college entrance requirements, and places of employment.

Counselors in high schools often help students find part-time jobs, either to enable them to stay in school or to help them prepare for their vocation. They may help both graduates and dropouts to find jobs or may direct them to community employment services. They also may conduct surveys to learn more about hiring experiences of recent graduates and dropouts, local job opportunities, or the effectiveness of the educational and guidance programs. Many help students individually with personal and social problems or lead group counseling sessions and discussion groups on topics related to student interests and problems.

Elementary school counselors help children to make the best use of their abilities by identifying these and other basic aspects of the child's makeup at an early age, and by evaluating any learning problems. Methods used in counsel-

ing grade school children differ in many ways from those used with older students. Observations of classroom and play activity furnish clues about children in the lower grades. To better understand children, elementary school counselors spend much time consulting with teachers and parents. They also work closely with other staff members of the school, including psychologists and social workers.

Some school counselors, particularly in secondary schools, teach classes in occupational information, social studies, or other subjects. They also may supervise school clubs or other extracurricular activities, often after regular school hours.

Places of Employment

About 44,000 people worked full time as public school counselors during 1974. Most counselors work in large schools. An increasing number of school districts, however, provide guidance services to their small schools by assigning more than one school to a counselor.

Training, Other Qualifications, and Advancement

Most States require school counselors to have counseling and teaching certificates. However, a growing number of States no longer require teacher certification. (See statements on Elementary and Secondary School Teachers for certificate requirements.) Depending on the State, graduate work and from 1 to 5 years of teaching experience usually are required for a counseling certificate. People who plan to become counselors should learn the requirements of the State in which they plan to work since requirements vary among States and change rapidly.

College students interested in becoming school counselors usually take the regular program of teacher education, with additional courses in psychology and sociology. In States where teaching experience is not a requirement, it is possible to major in a liberal arts program. A few States substitute counseling internship for teaching experience. In some States teachers who have completed part of the courses required for the master's degree are eligible for provisional certification and may work as counselors under supervision while they take additional courses.

Counselor education programs at the graduate level are available in more than 440 colleges and universities, most frequently in the departments of education or psychology. One to two years of graduate study are necessary for a master's degree. Most programs provide supervised field experience.

Subject areas of required graduate level courses usually include appraisal of the individual student, individual counseling procedures, group guidance, information service for career development, professional relations and ethics, and statistics and research.

The ability to help others accept responsibility for their own lives is important for school counselors because their work concerns the development of young people. They must be able to coordinate the activity of others and work as part of the team which forms the educational system.

School counselors may advance by moving to a larger school; becoming director or supervisor of counseling or guidance; or, with further graduate education, becoming a college counselor, educational psychologist, or school psychologist.

Employment Outlook

Employment of school counselors is likely to grow more slowly than the average for all occupations through the mid-1980's as the decline in school enrollments continues during the remainder of this decade. However, some positions will continue to be available in elementary schools. An expected upswing in enrollments beginning in the early 1980's should stimulate some expansion in employment, and additional counselors will be required each year to replace those who leave the profession.

In 1974, the average ratio of counselors to students as a whole was still well below generally accepted standards, despite Federal aid to the States for support and expansion of counseling programs. Some school systems were forced to eliminate some counselor positions due to local financial problems. Over the long run, demand for school counselors will depend in large part on the Federal Government's Career Education Program. This program is designed to inform children about the world of work early in their education, so that by the time they leave the formal educational system they are prepared for a suitable and available career. The extent of future growth in counselor employment will depend largely on the amount of funds which the Federal Government provides to the States.

Earnings and Working Conditions

School counselors holding bachelor's degrees earned average annual salaries ranging from $9,000 to $13,000 during 1974, according to the limited data available. For those having master's degrees, average yearly salaries were from $10,400 to $15,500. School counselors with doctorates had an average maximum salary of almost $18,200 per year. School counselors generally earn more than teachers at the same school. (See statements on Kindergarten and Elementary School Teachers and Secondary School Teachers.)

In most school systems, counselors receive regular salary increments as they obtain additional education and experience. Some counselors supplement their income by part-time consulting or other work with private or public counseling centers, government agencies, or private industry.

Sources of Additional Information

State departments of education can supply information on colleges and universities that offer training in guidance and counseling as well as on the State certification requirements.

Additional information on this field of work is available from:

American School Counselor Association, 1607 New Hampshire Ave. NW., Washington, D.C. 20009.

EMPLOYMENT COUNSELORS

(D.O.T. 045.108)

Nature of the Work

Employment counselors (sometimes called vocational counselors) help jobseekers evaluate their abilities and interests so that they can choose, prepare for, and adjust to a satisfactory field of work. The extent of counseling services given by employment counselors varies, depending on the job-seeker and the type of agency. Job-seekers may include veterans, youth with little or no work experience, the handicapped, older workers, and individuals displaced by automation and industry shifts or unhappy with their present occupational fields. Sometimes jobseekers are skilled in specific occupations and ready for immediate job placement, while those who have little education and lack marketable skills need intensive training to prepare for jobs. In State employment services, the counselor is also concerned with helping those who are least employable, such as welfare recipients, prison releasees, and the educationally and culturally deprived.

Counselors interview jobseekers to learn employment-related facts about their interests, training, work experience, work attitudes, physical capacities, and personal traits. If necessary, they may get additional data by arranging for aptitude and achievement tests and interest inventories, so that more objective help may be given. They may get additional information from sources such as former employers and schools.

When a jobseeker's background—the person's limitations and abilities—has been thoroughly reviewed, the employment counselor discusses occupational requirements and job opportunities in different fields within the potential of the jobseeker. Then, the counselor and the client develop a vocational plan. This plan may specify a series of steps involving remedial education, job training, work experience, or other services needed to enhance the person's employability. Often, in developing this plan, the employment counselor works with a team of specialists.

In many cases, employment counselors refer jobseekers to other agencies for physical rehabilitation or psychological or other services before or during counseling. Counselors must be familiar with the available community services so that they can select those most likely to benefit a particular jobseeker.

Counselors may help jobseekers by suggesting employment sources and appropriate ways of applying for work. In many cases when further support and assistance are needed, counselors may contact

employers to develop jobs for counseled applicants, although jobseekers usually are sent to placement interviewers after counseling. After job placement or entrance into training, counselors may follow up to determine if additional assistance is needed.

The expanding responsibility of public employment service counselors for improving the employability of disadvantaged persons has increased their contacts with these persons during training and on the job. Also, it has led to group counseling and the stationing of counselors in neighborhood and community centers.

Places of Employment

In 1974, about 3,500 persons, half of them women, worked as employment counselors in State employment service offices, located in every large city and many smaller towns. In addition, about 3,500 employment counselors worked for various private or community agencies, primarily in the larger cities. Some worked in institutions such as prisons, training schools for delinquent youths, and mental hospitals. Also, the Federal Government employed a limited number of employment counselors, chiefly in the Veterans Administration and in the Bureau of Indian Affairs. Some counselors teach in graduate training programs or conduct research.

Training, Other Qualifications, and Advancement

The national qualification standard for first level employment counselors in State employment service offices calls for 30 graduate semester hours of counseling courses beyond a bachelor's degree. However, 1 year of counseling-related experience may be substituted for 15 graduate semester hours.

All States require counselors in their public employment offices to meet State civil service or merit system requirements that include minimum educational and experience standards.

Applicants with advanced degrees and additional qualifying experience may enter at higher levels on the counselor career ladder. Many States also make provision for individuals with extensive experience in the employment service, whether or not they have college degrees, to enter the counselor career ladder and move upward by acquiring the prescribed university coursework and qualifying experience for each level.

Although minimum entrance requirements are not standardized among private and community agencies, most prefer, and some require, a master's degree in vocational counseling or in a related field such as psychology, personnel administration, counseling, guidance education, or public administration. Many private agencies prefer to have at least one staff member who has a doctorate in counseling psychology or a related field. For those lacking an advanced degree, employers usually emphasize experience in closely related work such as rehabilitation counseling, employment interviewing, school or college counseling, teaching, social work, or psychology.

In each State, the public employment service offices provide some in-service training programs for their new counselors or trainees. In addition, both their new and experienced counselors are often given part-time training at colleges and universities during the regular academic year or at institutes or summer sessions. Private and community agencies also often provide in-service training opportunities.

College students who wish to become employment counselors should enroll in courses in psychology and basic sociology. At the graduate level, requirements for this field usually include courses in techniques of counseling, psychological principles and psychology of careers, assessment and appraisal, cultures and environment, and occupational information. Counselor education pro-

grams at the graduate level are available in about 370 colleges and universities, mainly in departments of education or psychology. To obtain a master's degree, students must complete 1 to 2 years of graduate study.

Young people aspiring to be employment counselors should have a strong interest in helping others make vocational plans and carry them out. They should be able to work independently and to keep detailed records.

Well-qualified counselors with experience may advance to supervisory or administrative positions in their own or other organizations. Some may become directors of agencies or of other counseling services, or area supervisors of guidance programs; some may become consultants; and others may become professors in the counseling field.

Employment Outlook

Employment counselors with master's degrees or experience in related fields are expected to face some competition in both public and community employment agencies through the mid-1980's. Some growth in the number of employment counselors is expected as their role becomes more important in programs dealing with the training and retraining of unemployed workers, particularly those who are unskilled or whose jobs have been displaced by technological or industrial shifts. Expansion of these programs and consequently the extent of growth in employment of counselors will depend in large part on the level of funding by the Federal Government, as well as on the distribution of revenue sharing money allocated to these programs by the individual States. Some openings for employment counselors will result from the need to replace those who die, retire, or transfer to other occupations.

Earnings and Working Conditions

Salaries of employment counselors in State employment services vary considerably by State. In 1974, minimum salaries ranged from about $7,200 to $14,700 a year, with an average of $9,100. Maximum salaries ranged from $9,700 to $19,100, with an average of $11,900. More than three-quarters of the States listed maximum salaries of $11,900 or more. Trainees for counseling positions in some voluntary agencies in large cities were being hired at about $8,500 a year. Salaries of some employment counselors in private and community agencies were as high as $20,000 although the average was about $12,000 annually. In general, salaries of employment counselors are about 1 1/2 times as high as average earnings for all nonsupervisory workers in private industry, except farming.

Most counselors work about 40 hours a week and have various benefits, including vacations, sick leave, pension plans, and insurance coverage. Counselors employed in community agencies may work overtime.

Sources of Additional Information

For general information on employment or vocational counseling, contact:

National Employment Counselors Association, 1607 New Hampshire Ave. NW., Washington, D.C. 20009.

National Vocational Guidance Association, Inc., 1607 New Hampshire Ave. NW., Washington D.C. 20009.

U.S. Department of Labor, Manpower Administration, USES, Division of Counseling and Testing, Washington, D.C. 20210.

The administrative office for each State's employment security agency, bureau, division, or commission can supply specific information about local job opportunities, salaries, and entrance requirements for positions in public employment service offices.

REHABILITATION COUNSELORS

(D.O.T. 045.108)

Nature of the Work

Rehabilitation counselors help people with physical, mental, or social disabilities to adjust their vocational plans and personal lives. Counselors learn about clients' interests, abilities, and limitations. They then use this information, along with available medical and psychological data, to help disabled persons evaluate themselves for the purpose of pairing their physical and mental capacity and interests with suitable work.

Together, the counselor and client develop a plan of rehabilitation, with the aid of other specialists responsible for the medical care and occupational training of the handicapped person. As the plan is put into effect, the counselor meets regularly with the disabled person to discuss his progress in the rehabilitation program and help resolve any problems that have been encountered. When the client is ready to begin work, the counselor helps him find a suitable job, and usually makes followup checks to insure that the placement has been successful.

Rehabilitation counselors must maintain close contact with the families of their handicapped clients, other professionals who work with handicapped people, agencies and civic groups, and private employers who hire the disabled. Counselors in this field often perform related activities, such as informing employers of the abilities of the handicapped and arranging for publicizing the rehabilitation program in the community.

An increasing number of counselors specialize in a particular area

of rehabilitation; some may work almost exclusively with blind people, alcoholics or drug addicts, the mentally ill, or retarded persons. Others may work almost entirely with persons living in poverty areas.

The amount of time spent in counseling each client varies with the severity of the disabled person's problems as well as with the size of the counselor's caseload. Some rehabilitation counselors are responsible for many persons in various stages of rehabilitation; on the other hand, less experienced counselors or those working with the severely disabled may work with relatively few cases at a time.

Rehabilitation counselor assisting blind person in use of cassette tape recorder.

Places of Employment

About 19,000 persons, one-third of them women, worked as rehabilitation counselors in 1974. About 70 percent worked in State and local rehabilitation agencies financed cooperatively with Federal and State funds. Some rehabilitation counselors and counseling psychologists worked for the Veterans Administration. Rehabilitation centers, sheltered workshops, hospitals, labor unions, insurance companies, special schools, and other public and private agenices with rehabilitation programs and job placement services for the disabled employ the rest.

Training, Other Qualifications, and Advancement

A bachelor's degree with courses in counseling, psychology, and related fields is the minimum educational requirement for rehabilitation counselors. However, employers are placing increasing emphasis on the master's degree in vocational counseling or rehabilitation counseling, or in related subjects such as psychology, education, and social work. Work experience in fields such as vocational counseling and placement, psychology, education, and social work is an asset for securing employment as a rehabilitation counselor. Most agencies have work-study programs whereby employed counselors can earn graduate degrees in the field.

Usually, 2 years of study are required for the master's degree in the fields preferred for rehabilitation counseling. Included is a semester of actual work experience as a rehabilitation counselor under the close supervision of an instructor. Besides a basic foundation in psychology, courses generally included in master's degree programs are counseling theory and techniques, occupational and educational information, and community resources. Other requirements may include courses in placement and followup, tests and measurements, cultural and psychological effects of disability, and medical and legislative aspects of therapy and rehabilitation. About 85 schools offered graduate training in rehabilitation counseling in 1974.

To earn the doctorate in rehabilitation counseling or in counseling psychology may require a total of 4 to 6 years of graduate study. Intensive training in psychology and other social sciences, as well as in research methods, is required.

Many States require that rehabilitation counselors be hired in accordance with State civil service and merit system rules. In most cases, these regulations require applicants to pass a competitive written test, sometimes supplemented by an individual interview and evaluation by a board of examiners.

Since rehabilitation counselors deal with the welfare of individuals, the ability to accept responsibility is important. It also is essential that they be able to work independently and be able to motivate and guide the activity of others.

Counselors who have limited experience usually are assigned the less difficult cases. As they gain experience, their caseloads are increased and they are assigned clients with more complex rehabilitation problems. After obtaining considerable experience and more graduate education, rehabilitation counselors may advance to supervisory positions or top administrative jobs.

Employment Outlook

Employment opportunities for rehabilitation counselors are expected to be favorable through the mid-1980's. Persons who have graduate work in rehabilitation counseling or in related fields are expected to have the best employment prospects.

Contributing to the long-run demand for rehabilitation counselors will be population growth and the extension of service to a greater number of the severely disabled, together with increased public awareness that the vocational rehabilitation approach helps the disabled to become self-supporting. The extent of growth in employment of counselors, however, will depend largely on levels of government funding for vocational rehabilitation. In addition to growth needs, many counselors will be required annually to replace those who die, retire, or leave the field for other reasons.

Earnings and Working Conditions

Salaries of beginning rehabilitation counselors in State agencies averaged $9,300 a year in 1974. Experienced counselors earned average salaries of $12,200 a year; the range was $9,800 to $16,400 among the States.

The Veterans Administration paid counseling psychologists with a 2-year master's degree and 1 year of subsequent experience—and those with a Ph. D.—starting salaries of $15,481 in late 1974. Those with a Ph. D. and a year of experience, and those with a 2-year master's degree and much experience, started at $18,463. Some rehabilitation counselors with a bachelor's degree were hired at starting salaries of $10,520 and $12,841. In general, salaries of rehabilitation counselors are above the average earnings for all nonsupervisory workers in private industry, except farming.

Counselors may spend only part of their time in their offices counseling and performing necessary paperwork. The remainder of their time is spent in the field, working with prospective employers, training agencies, and the disabled person's family. The ability to drive a car often is necessary for fieldwork.

Rehabilitation counselors generally work a 40-hour week or less, with some overtime work required to attend community and civic meetings in the evening. They usually are covered by sick and annual leave benefits, and pension and health plans.

Sources of Additional Information

For information about rehabilitation counseling as a career, contact:

American Psychological Association, Inc., 1200 17th St. NW., Washington, D.C. 20036.

American Rehabilitation Counseling Association, 1607 New Hampshire Ave. NW., Washington, D.C. 20009.

National Rehabilitation Counseling Association, 1522 K St. NW., Washington, D.C. 20005.

COLLEGE CAREER PLANNING AND PLACEMENT COUNSELORS

(D.O.T. 166.268)

Nature of the Work

Choosing a career and deciding whether or not to go to graduate school are among the difficult decisions faced by many college students. Career planning and placement counselors are employed by colleges to offer encouragement and assistance in these decisions.

Career planning and placement counselors, sometimes called college placement officers, provide a variety of services to college students and alumni. They assist students in making career selections by encouraging them to examine their interests, abilities, and goals, and then helping them to explore possible career alternatives and to choose an occupational area that is best suited to their individual needs. They advise students considering dropping out of college of the opportunities open to them. They also help students to get part-time and summer jobs.

Career planning and placement counselors arrange for job recruiters to visit the campus to discuss their firm's personnel needs and to interview applicants. They provide employers with information about students and help in appraising students' qualifications. They must keep abreast of information concerning job market developments in order to contact prospective employers, help students prepare for promising fields, and encourage the faculty and college administration to provide pertinent courses. Most career counselors also assemble and maintain a library of career guidance information and recruitment literature.

Placement counselors may specialize in areas such as law, education, or part-time and summer work. However, the extent of specialization usually depends upon the size and type of college as well as the size of the placement staff.

Places of Employment

Nearly all 4-year colleges and universities and many of the increasing number of junior colleges provide career planning and placement services to their students and alumni. Large colleges may employ several counselors working under a director of career planning and placement activities; in many institutions, however, a combination of placement functions is performed by one director aided by a clerical staff. In some colleges, especially the smaller ones, the functions of career counselors may be performed on a part-time basis by members of the faculty or administrative staff. Universities frequently have placement officers for each major branch or campus.

About 4,100 persons, one-half of them women, worked as career planning and placement counselors in colleges and universities in 1974. Most were employed on a full-time basis. An additional 1,200 worked in junior colleges; about two-thirds worked part time.

Training, Other Qualifications, and Advancement

Although no specific educational program exists to prepare persons for career planning and placement work, a bachelor's degree, preferably in a behavioral science such as psychology or sociology, is customary for entry into the field, and a master's degree is increas-

ingly being stressed.

In 1974, more than 100 colleges and universities offered graduate programs in college student personnel work. Graduate courses that are helpful for career planning and placement counseling include counseling theory and techniques, vocational testing, theory of group dynamics, and occupational research and employment trends.

Some people enter the career planning and placement field after gaining a broad background of experience in business, industry, government, or educational organizations. An internship in a career planning and placement office also is helpful.

College career planning and placement counselors must have an interest in people. They must be able to communicate with and gain the confidence of students, faculty, and employers in order to develop insight into the employment needs of both employers and students. People in this field should be energetic and able to work under pressure, since they must organize and administer a wide variety of activities.

Advancement for career planning and placement professionals usually is through promotion to an assistant or associate position, director of career planning and placement, director of student personnel services, or some other higher level administrative position. However, the extent of such opportunity usually depends upon the type of college or university and the size of the staff.

Counselor discusses career alternatives with college student.

Employment Outlook

The overall employment outlook for well-qualified college career planning and placement counselors is expected to be favorable through the mid-1980's. Employment growth in the field is expected to be about as fast as the average for all occupations as college enrollments continue to increase through the early 1980's. Demand will be greatest for persons with specialized training in career counseling in junior and community colleges, where, in many cases, there are no career planning and placement programs at present. Also contributing to the demand will be expected continued expansion in services to students from minority and low-income groups, who require special counseling in choosing careers and assistance in finding part-time jobs to help pay for their education. Growth is also expected in services to the handicapped and to adults participating in continuing education.

However, many institutions of higher education faced financial problems in 1974. If this situation persists, colleges and universities may be forced to limit expansion of counseling and placement services, resulting in competition for available positions during this period.

Earnings and Working Conditions

The average salary of college career planning and placement directors was more than $17,000 a year in 1974, according to limited information. Average salaries for directors in large public universities were $19,300; in small private colleges, about $10,700. Salaries for college career planning and placement counselors ranged from $7,000 to $15,000 a year.

Career planning and placement counselors frequently work more than a 40-hour week; irregular hours and overtime often are neces-

sary, particularly during the "recruiting season." Most counselors are employed on a 12-month basis. They are paid for holidays and vacations and usually receive the same benefits as other professional personnel employed by colleges and universities.

Sources of Additional Information

A list of schools that offer courses in career counseling and placement and a booklet on the college student personnel professions, as well as other information on career counseling and placement, are available from:

The College Placement Council, Inc., P.O. Box 2263, Bethlehem, Pa. 18001.

CLERGY

Deciding on a career in the clergy involves considerations different from those involved in other career choices. When young persons choose to enter the ministry, priesthood, or rabbinate, they do so primarily because they possess a strong religious faith and a desire to help others. Nevertheless, it is important for young people to know as much as possible about the profession and how to prepare for it, the kind of life it offers, and its needs for personnel.

The number of clergy needed depends largely on the number of people who participate in organized religious groups. This affects the number of churches and synagogues established and pulpits to be filled. In addition to the clergy who serve congregations, many others teach or act as administrators in seminaries and in other educational institutions; still others serve as chaplains in the Armed Forces, industry, correctional institutions, hospitals or on college campuses; or render service as missionaries or in social welfare agencies.

Persons considering a career in the clergy should seek the counsel of a religious leader of their faith to aid in evaluating their qualifications. The most important of these are a deep religious belief and a desire to serve the spiritual needs of others. The priest, minister, or rabbi also is expected to be a model of moral and ethical conduct. A person considering one of these fields must realize that the civic, social, and recreational activities of a member of the clergy often are influenced and restricted by the customs and attitudes of the community.

The clergy should be sensitive to the needs of others and able to help them deal with these needs. The job demands an ability to speak and write effectively, to organize, and to supervise others. The person entering this field also must enjoy studying because the ministry is an occupation which requires continuous learning. In addition, the ministry demands considerable initiative and self-discipline.

More detailed information on the clergy in the three largest faiths in the United States—Protestant, Roman Catholic, and Jewish—is given in the following statements, prepared in cooperation with leaders of these faiths. Information on the clergy in other faiths may be obtained directly from leaders of the respective groups.

PROTESTANT MINISTERS

(D.O.T. 120.108)

Nature of the Work

Protestant ministers lead their congregations in worship services and administer the rites of baptism, confirmation, and Holy Communion. They prepare and deliver sermons and give religious instruction to persons who are to become new members of the church. They also perform marriages; conduct funerals; counsel individuals who seek guidance; visit the sick, aged, and handicapped at home and in the hospital; comfort the bereaved; and serve church members in other ways. Many Protestant ministers write articles for publication, give speeches, and engage in interfaith, community, civic, educational, and recreational activities sponsored by or related to the interests of the church. Some ministers teach in seminaries, colleges, and universities.

The services that ministers conduct differ among Protestant denominations and also among congregations within a denomination. In many denominations, ministers follow a traditional order of worship; in others they adapt the services to the needs of youth and other groups within the congregation. Most services include Bible reading, hymn singing, prayers, and a sermon. In some denominations, Bible reading by a member of the congregation and individual testimonials may constitute a large part of the service.

Ministers serving small congregations generally work on a personal basis with their parishioners. Those serving large congregations have greater administrative responsibilities, and spend considerable time working with committees, church officers, and staff, besides performing their other duties. They may have one or more associates or assistants who share specific aspects of the ministry, such as a minister of education who assists in educational programs for different age groups, or a minister of music.

Places of Employment

In 1974, about 185,000 ministers—about 3 percent of them women—served 72 million Protestants. Most ministers serve individual congregations. In addition, however, thousands of ministers were in closely related fields such as chaplains in hospitals and the Armed Forces. The greatest number of clergy are affiliated with the five largest groups of churches – Baptist, United Methodist, Lutheran, Presbyterian, and Episcopal.

All cities and most towns in the United States have at least one Protestant church with a full-time

minister. Although the majority of ministers are located in urban areas, many live in less densely populated areas where they may serve two or more congregations.

Training and Other Qualifications

Educational requirements for entry into the Protestant ministry vary greatly. Some denominations have no formal educational requirements, and others ordain persons having varying amounts and types of training in Bible colleges, Bible institutes, or liberal arts colleges. A large number of denominations require a 3-year course of professional study in a theological school or seminary following college graduation. A degree of bachelor or master of divinity is awarded upon completion.

In 1974, there were 132 theological institutes accredited by the American Association of Theological Schools. These admit only students who have received a bachelor's degree or its equivalent from an accredited college.

Recommended preseminary courses include English, history, philosophy, the natural sciences, social sciences, the fine arts, music, religion, and foreign languages. However, students considering theological study should contact, at the earliest possible date, the school or schools to which they intend to apply, in order to learn what will best prepare them for the program they expect to enter.

The standard curriculum recommended for accredited theological schools consists of four major types of courses: biblical, historical, theological, and practical. In recent years, greater emphasis has been placed on courses of a practical nature such as psychology, religious education, and administration. Many accredited schools require that students gain experience in church work under the supervision of a faculty member or experienced minister. Some institutions offer master of theology and doctor of theology degrees to students completing 1 year or more of additional study. Scholarships and loans are available for students of theological institutions.

In general, each large denomination has its own school or schools of theology that reflect its particular doctrine, interests, and needs. However, many of these schools are open to students from other denominations. Several interdenominational schools associated with universities give both undergraduate and graduate training covering a wide range of theological points of view.

Persons who have denominational qualifications for the ministry usually are ordained following graduation from a seminary. In denominations that do not require seminary training, clergy are ordained at various appointed times. Men and women entering the clergy often begin their careers as pastors of small congregations or as assistant pastors in large churches.

Employment Outlook

The trend toward merger and unity among denominations, combined with the closing of smaller parishes and the downturn in financial support, has reduced demand for Protestant ministers in recent years. As a result, new graduates of theological schools will face increasing competition in finding positions. The supply-demand situation will vary among denominations and the chance of obtaining employment will depend, in part, on the length of the candidate's formal preparation. Most of the openings for clergy that are expected through the mid-1980's will therefore result from the need to replace those in existing positions who retire, die, or leave the ministry.

Although fewer opportunities may arise for Protestant ministers to serve individual congregations, newly ordained ministers may find work in youth, family relations, and welfare organizations; religious education; on the campus; and as chaplains in the Armed Forces, hospitals, universities, and correctional institutions.

Earnings and Working Conditions

Salaries of Protestant clergy vary substantially, depending on age, experience, education, denomination, size and wealth of congregation, type of community, and geographic location. According to a study by the National Council of Churches of Christ, median salaries for Protestant ministers in 1973 were about $10,500 plus $1,200 in fringe benefits. However, on the average, ministers had to pay over $1,100 out of their own monies for professionally related expenses, particularly travel. Annual vacations average 3 weeks and there is often opportunity for time off.

Because of the wide range of service that the minister provides, he or she may work long or irregular hours, often involving considerable travel.

Sources of Additional Information

Persons who are interested in the Protestant ministry should seek the counsel of a minister or church guidance worker. Additional information is available from many denominational offices. Each theological school can supply information on admission requirements.

RABBIS

(D.O.T. 120.108)

Nature of the Work

Rabbis are the spiritual leaders of their congregations and teachers and interpreters of Jewish law and tradition. They conduct religious services and deliver sermons at services on the Sabbath and on Jewish holidays. Rabbis customarily are available at all times to counsel members of their congregation, other followers of Judaism, and the community at large. Like other clergy, rabbis conduct weddings and funeral services, visit the sick, help the poor, comfort the bereaved, supervise religious education programs, engage in interfaith activities, and involve themselves in community affairs.

Rabbis serving large congregations may spend considerable time in administrative duties, working with their staffs and committees. Large congregations frequently have an associate or assistant rabbi. Many assistant rabbis serve as educational directors.

Rabbis serve either Orthodox, Conservative, or Reform congregations. Regardless of their particular point of view, all Jewish congregations preserve the substance of Jewish religious worship. The congregations differ in the extent to which they follow the traditional form of worship—for example, in the wearing of head coverings, the use of Hebrew as the language of prayer, or the use of music or a choir. The format of the worship service and, therefore, the ritual that the rabbis use may vary even among congregations belonging to the same branch of Judaism.

Rabbis also may write for religious and lay publications, and teach in theological seminaries, colleges, and universities.

Places of Employment

About 4,000 rabbis served over 6 million followers of the Jewish faith in this country in 1974; approximately 1,550 were Orthodox rabbis, 1,350 were Conservative, and 1,100 Reform. Others work as chaplains in the military services, in hospitals and other institutions, or in one of the many Jewish community service agencies. A growing number are employed in colleges and universities as teachers in Jewish Studies programs.

Although rabbis serve Jewish communities throughout the Nation, they are concentrated in those States that have large Jewish populations, particularly New York, California, Pennsylvania, New Jersey, Illinois, Massachusetts, Florida, Maryland, and the Washington, D.C. metropolitan area.

Training and Other Qualifications

To become eligible for ordination as a rabbi, a student must complete a prescribed course of study in a seminary. Entrance requirements and the curriculum depend upon the branch of Judaism with which the seminary is associated.

Nearly 30 seminaries train Orthodox rabbis in programs of varying lengths. The required course of study to prepare for ordination is usually 3 or 4 years. However, students who are not college graduates may spend a longer period at these seminaries and complete the requirements for the bachelor's degree while pursuing the rabbinic course. Some

Orthodox seminaries do not require a college degree to qualify for ordination, although students who qualify usually have completed 4 years of college.

The Hebrew Union College—Jewish Institute of Religion is the official seminary that trains rabbis for the Reform branch of Judaism. It is the only branch that has approved the training and ordination of women as rabbis. The Jewish Theological Seminary of America is the official seminary that trains rabbis for the Conservative branch of Judaism. Both seminaries require the completion of a 4-year college course, as well as earlier preparation in Jewish studies, for admission to the rabbinic program leading to ordination. Normally 5 years of study are required to complete the rabbinic course at the Reform seminary, including 1 year of preparatory study in Jerusalem. Exceptionally well-prepared students can shorten this 5-year period to a minimum of 3 years. A student having a strong background in Jewish studies can complete the course at the Conservative seminary in 4 years; for other enrollees, the course may take as long as 6.

In general, the curriculums of Jewish theological seminaries provide students with a comprehensive knowledge of the Bible, Talmud, Rabbinic literature, Jewish history, theology, and courses in education,

pastoral psychology, and public speaking. The Reform seminary places less emphasis on the study of Talmud and Rabbinic literature; it offers, instead, a broad course of study that includes subjects such as human relations and community organization.

Some seminaries grant advanced academic degrees in fields such as Biblical and Talmudic research. All Jewish theological seminaries make scholarships and loans available.

Newly ordained rabbis usually begin as leaders of small congregations, assistants to experienced rabbis, directors of Hillel Foundations on college campuses, teachers in seminaries and other educational institutions, or chaplains in the Armed Forces. As a rule, the pulpits of large and well established Jewish congregations are filled by experienced rabbis.

Employment Outlook

The demand for Rabbis has declined in recent years because some established congregations have closed and fewer new ones are being formed. As a result, many newly ordained Rabbis will take positions in smaller Jewish communities and as assistant Rabbis in larger Jewish congregations. Opportunities still exist for Rabbis to teach in colleges and universities, to serve as chaplains in the Armed Forces, and to work in hospitals and other institutions or in one of the many Jewish social service agencies. Openings in established congregations will come largely from a need to replace those Rabbis who retire or die.

Earnings and Working Conditions

In 1974, newly ordained Rabbis averaged about $17,000-$18,000 a year in salary and other benefits, including housing, pension, etc. Most established Rabbis earned between $20,000 and $35,000 a year, with some earning as much as $50,000-$60,000. Incomes vary depending on the size and financial status of the congregation, as well as its denominational branch and geographic location. Rabbis usually earn additional income from gifts or fees for officiating at ceremonies such as weddings.

Rabbis' working hours are determined by their role in the congregation. Besides conducting regular religious services, they may also spend considerable time in administrative, educational, and community service functions, as well as presiding over various ceremonial services. Rabbis must also be available to serve the emergency needs of their congregation members.

Sources of Additional Information

Young people who are interested in entering the rabbinate should seek the guidance of a rabbi. Information on the work of a rabbi and occupations allied to it is also available from many of the local Boards of Rabbis in large communities. Each Jewish theological seminary can supply information on its admission requirements.

ROMAN CATHOLIC PRIESTS

(D.O.T. 120.108)

Nature of the Work

Roman Catholic priests attend to the spiritual, pastoral, moral, and educational needs of the members of their church. Their duties include presiding at liturgical functions; offering religious enlightenment in the form of a sermon; hearing confessions; administering the Sacraments, (including the sacraments of Marriage and Penance); and conducting funeral services. They also comfort the sick, console relatives and friends of the dead, counsel those in need of guidance, and assist the poor.

Priests spend long hours working for the church and the community. Their day usually begins with morning meditation and Mass, and may end with the hearing of confessions or an evening visit to a hospital or a home. Many priests direct and serve on church committees, work in civic and charitable organizations, and assist in community projects.

There are two main classifications of priests—diocesan (secular) and religious. Both types have the same powers acquired through ordination by a bishop. The differences lie in their way of life, the type of work to which they are assigned, and the church authority to whom they are immediately subject. Diocesan priests generally work as individuals in parishes assigned to them by the bishop of their diocese. Religious priests generally work as part of a religious order, such as the Jesuits, Dominicans, or Franciscans. They engage in specialized activities such as teaching or missionary work assigned to them by superiors of their order.

Both religious and diocesan priests hold teaching and administrative posts in Catholic seminaries, colleges and universities, and high

schools. Priests attached to religious orders staff a large proportion of the institutions of higher education and many high schools, whereas diocesan priests are usually concerned with the parochial schools attached to parish churches and with diocesan high schools. The members of religious orders do most of the missionary work conducted by the Catholic Church in this country and abroad.

Places of Employment

Approximately 57,000 priests served nearly 49 million Catholics in the United States in 1974. There are priests in nearly every city and town and in many rural communities. The majority are in metropolitan areas, where most Catholics reside. Catholics are concentrated in the Northeast and Great Lakes regions, with smaller concentrations in California, Texas, and Louisiana. Large numbers of priests are located in communities near Catholic educational and other institutions.

Training and Other Qualifications

Preparation for the priesthood generally requires 8 years of study beyond high school. There are almost 400 seminaries offering post-high school education. Preparatory study may begin in the first year of high school, at the college level, or in theological seminaries after college graduation.

High school seminaries provide a college preparatory program that emphasizes English grammar, speech, literature, and social studies. Two years of Latin are required and the study of modern language is encouraged. The seminary college offers a liberal arts program, stressing philosophy and religion; the study of man through the behavioral sciences and history; and the natural sciences and mathematics. In many college seminaries, a student may concentrate in any of these fields.

The remaining 4 years of preparation include sacred scripture; apologetics (the branch of theology concerning the defense and proofs of Christianity); dogmatic, moral, and pastoral theology; homeletics (art of preaching); church history; liturgy (Mass); and canon law. Field work experience is usually required in addition to classroom study. Diocesan and religious priests attend different major seminaries, where slight variations in the training reflect the differences in the type of work expected of them as priests. Priests are not permitted to marry.

Postgraduate work in theology is offered at a number of American Catholic universities or at ecclesiastical universities around the world, mostly in Rome. Also, many priests do graduate work at other universities in fields unrelated to theology. Priests are commanded by the law of the Catholic Church to continue their studies, at least informally, after ordination.

Young men are never denied entry into seminaries because of lack of funds. In seminaries for secular priests, the church authorities may make arrangements for student scholarships or loans. Those in religious seminaries are financed by contributions of benefactors.

The first assignment of a newly ordained secular priest is usually that of assistant pastor or curate. Newly ordained priests of religious orders are assigned to the specialized duties for which they are trained. Many opportunities for greater responsibility exist within the church, depending on the talents, interests, and experience of the individual.

Employment Outlook

A growing number of priests will be needed in the years ahead to provide for the spiritual, educational, and social needs of the increasing number of Catholics in the Nation. The number of ordained priests has been insufficient to fill the needs of newly established parishes and other Catholic institutions, and to replace priests who retire or die. This situation is likely to persist. However, some of the duties of priests are being assigned to lay deacons. Although priests usually continue to work longer than persons in other professions, the varied demands and long hours create a need for young priests to assist the older ones. Also, an increasing number of priests have been acting in many diverse areas of service—in social work; religious radio, newspaper, and television work; and labor-management mediation. They also have been serving in foreign posts as missionaries, particularly in countries that have a shortage of priests.

Earnings and Working Conditions

Diocesan priests usually receive a stipend of between $2,000 and $6,000 a year as well as maintenance provisions (room and board, housekeeping, etc.). Religious priests are generally supported by their religious order.

Priests who do special work related to the church, such as teaching, usually receive a partial salary which is less than a lay person in the same position would receive. The difference between the usual salary for these jobs and the salary that the priest receives is called "contributed service." In some of these situations, housing and related expenses may be provided; in other cases, the priest must make his own arrangements. Some priests doing special work may receive the same compensation that a lay person would receive. These may include priests working as lawyers, counselors,

consultants, etc.

Due to the wide range of duties which most clergy have, the priest often must work long and irregular hours. His working conditions vary widely with the type and area of assignment.

Sources of Additional Information

Young men interested in entering the priesthood should seek the guidance and counsel of their parish priest. For information regarding the different religious orders and the secular priesthood, as well as a list of the seminaries which prepare students for the priesthood, contact the diocesan Directors of Vocations through the office of the local pastor or bishop.

OTHER SOCIAL SERVICE OCCUPATIONS

COOPERATIVE EXTENSION SERVICE WORKERS

(D.O.T. 096.128)

Nature of the Work

Extension service workers are engaged with the rural area population in educational work in fields such as agriculture, home economics, youth activities, and community resource development. They are employed jointly by State land-grant universities and the U.S. Department of Agriculture. Extension workers must be proficient in both subject matter and teaching methods.

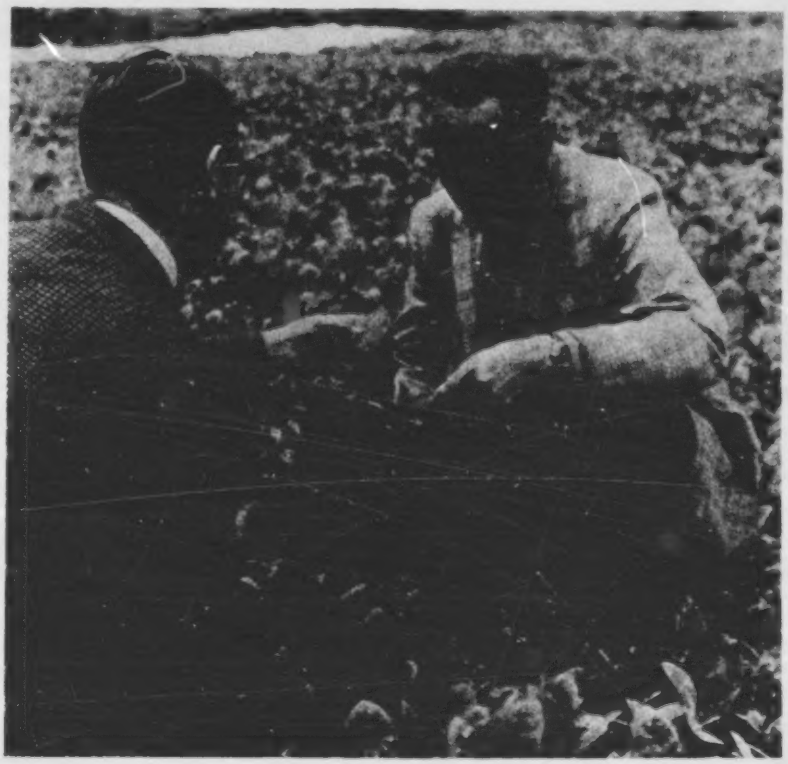
Extension workers help rural families analyze and solve their farm and home problems and aid in community improvement. Much of this educational work is carried on in groups, through meetings, tours, demonstrations, and use of local volunteer leaders. On problems that cannot be solved satisfactorily by such group methods, extension workers give individual assistance. In their work, they make much use of mass communication media such as newspapers, radio, and television.

County extension workers help farmers produce higher quality crops and livestock more efficiently. They also help them develop new markets and plan production to meet market demands, including those for product quality and variety. They also help community leaders to improve the community, by planning and providing for economic development, recreation, and more adequate public facilities such as schools, water supply and sewer systems, and libraries. They help homemakers to provide more family enjoyment from existing resources, a higher level of nutrition, and a more pleasant home environment. Some extension workers help youths to become more useful citizens and to gain more personal satisfaction through programs in career selection, recreation, health, and leadership. The essence of extension work is to help people help themselves to achieve the goals they think are important.

County extension workers are aided by State Extension Service specialists. The job of these specialists is to keep abreast of the latest research in their particular fields of interest, interpret this for use in extension work, and help county extension workers develop educational programs, activities, and events to use this new knowledge.

Cooperative Extension Services employ persons with a wide range of skills and with specialized training in all phases of crop and livestock production, conservation, environmental improvement, farm management and marketing, family living, human development, nutrition, home management, child development, sociology, psychology, veterinary medicine, engineering, textiles and clothing, resource economics, and business and public administration.

The usual career ladder for ex-



Extension workers help farmers produce higher quality crops.

tension workers is from assistant county agent to a more responsible job within that county, or in another county in the State, to an assignment on the State Extension Service staff.

Places of Employment

Extension workers are located in county offices, area offices serving multicounty units, and State offices, the last usually on the campus of the land-grant college or university.

Agents are located in nearly every county in the 50 States, in Puerto Rico, and in the District of Columbia. County staffs range in size from one agent (serving a wide variety of clientele interests) to a dozen or more specialized agents in counties with high population density and great diversity of interests. Staffs are located in counties ranging from the most rural to the most urban.

Training, Other Qualifications, and Advancement

Cooperative Extension Service agents are required to be proficient in disciplines related to the needs and programs of the clientele with whom they work. They must have a bachelor's degree in their subject-matter field; some training in educational techniques is desirable, as well.

Often, they receive training in extension techniques in a pre-induction training program, and are upgraded through regular in-service training programs in both educational techniques and the subject matter for which they are responsible. In addition to subject-matter proficiency, extension workers must like to work with people and to help them.

In most States, specialists and agents assigned to multicounty and State staff jobs are required to have at least one advanced degree and in many they must have a Ph. D.

Employment Outlook

Extension services employ more than 15,600 professional people. The demand for these workers is expected to increase, especially in depressed rural areas. As agricultural technology becomes more complicated, and as farm people become more aware of the need for organized activity, more help will be sought from trained Extension Service personnel. The Extension Service also will reach new segments of the population as residents recognize the value of its assistance, particularly in helping the disadvantaged.

Earnings

The salaries of extension workers vary by locality, but, for the most part, they are competitive with similar jobs in industry and government.

Sources of Additional Information

Additional information is available from County Extension offices, the State Director of the Cooperative Extension Service located at each land-grant university; or the Extension Service, U.S. Department of Agriculture, Washington, D.C. 20250.

HOME ECONOMISTS

(D.O.T. 096.128)

Nature of the Work

Home economists work to improve products, services, and practices that affect the comfort and well-being of the family. Some specialize in specific areas, such as consumer economics, housing, home management, home furnishings and equipment, food and nutrition, clothing and textiles, and child development and family relations. Others have a broad knowledge of the whole professional field.

Most home economists teach. Those in high schools teach students about foods and nutrition; clothing selection, construction and care; child development; consumer education; housing and home furnishings; family relations; and other subjects related to family living and homemaking. They also perform the regular duties of other high school teachers that are described in the statement on Secondary School Teachers elsewhere in the *Handbook*.

Teachers in adult education programs help men and women to increase their understanding of family relations and to improve their homemaking skills. They also conduct training programs on secondary, postsecondary, and adult levels for jobs related to home economics. Special emphasis is given to teaching those who are disadvantaged and handicapped. College teachers may combine teaching and research and often specialize in a particular area of home economics.

Home economists employed by private business firms and trade associations promote the development, use, and care of specific home products. They may do research, test products, and prepare advertisements and instructional materials. They also may prepare and present programs for radio and television; serve as consultants; give lectures and demonstrations before the public; and conduct classes for sales persons and appliance service workers. Some home economists study consumer needs and help manufacturers translate these needs into useful products.

Some home economists conduct research for the Federal Government, State agricultural experiment stations, colleges, universities, and private organizations. The U.S. Department of Agriculture employs the largest group of researchers to do work such as study the buying and spending habits of families in

Some home economists work with young children.

all socioeconomic groups and develop budget guides.

Home economists who work for the Cooperative Extension Service conduct adult education programs for men and women and 4-H Club and other youth programs for girls and boys, in areas such as home management, consumer education, family relations, and nutrition. Extension Service home economists also train and supervise volunteer leaders and paid aides who teach adults and youth. (See statement on Cooperative Extension Service Workers elsewhere in the *Handbook*.)

Federal, State, and local governments and private agencies employ home economists in social welfare programs to advise and counsel clients on the practical knowledge and skills needed for effective everyday family living. They also may help handicapped homemakers and their families adjust to physical as well as social and emotional limitations by changing the arrangements in the home; finding efficient ways to manage household chores; aiding in the design, selection, and arrangement of equipment; and creating other methods and devices to enable disabled people to function at their highest possible level. Other home economists in welfare agencies supervise or train workers who provide temporary or part-time help to households disrupted by illness.

Home economists in health services provide special help and guidance in home management, consumer education and family economics as these relate to family health and well-being. Activities of home economists working in health programs include the following: making home visits; conducting clinic demonstrations and classes in homemaking skills; counseling in the management of time and resources, including financial aspects; assisting mentally retarded parents in developing their potential skills for child care and home management; working with agencies and community resources; and supervising nutrition and home management aides.

Places of Employment

About 128,000 people worked in home economics professions in 1974. This figure includes 33,000 dietitians and 5,800 Cooperative Extension Service workers who are discussed in separate statements elsewhere in the *Handbook*.

About 75,000 home economists are teachers, about 50,000 in secondary schools and 7,000 in colleges and universities. More than 15,000 are adult education instructors, some of whom teach part time in secondary schools. Others teach in community colleges, elementary schools, kindergartens, nursery schools, and recreation centers.

More than 5,000 home economists work in private business firms and associations. Several thousand are in research and social welfare programs. A few are self-employed.

Although most home economists are women, men are entering the profession in increasing numbers. Most men specialize in foods and institutional management, although some are in the family relations and child development field, applied arts, consumer education, and other areas.

Training, Other Qualifications, and Advancement

About 360 colleges and universities offer a bachelor's degree in home economics, which qualifies graduates for most entry positions in the field. A master's or doctor's degree is required for college teaching, for certain research and supervisory positions, for work as an extension specialist, and for some jobs in nutrition.

Home economics majors study sciences and liberal arts—particularly social sciences—as well as specialized home economics courses. They may concentrate in a particular area of home economics or in

what is called general home economics. Advanced courses in chemistry and nutrition are important for work in foods and nutrition; science and statistics for research work; and journalism for advertising, public relations work, and all other work in the communications field. To teach home economics in high school, students must complete the courses required for a teacher's certificate.

Scholarships, fellowships, and assistantships are available for undergraduate and graduate study. Although colleges and universities offer most of these financial grants, government agencies, research foundations, businesses, and the American Home Economics Association Foundation provide additional funds.

Home economists must be able to work with people of various incomes and cultural backgrounds and should have a capacity for leadership. Poise and an interest in people also are essential for those who deal with the public. The ability to write and speak well is important. Among the subjects recommended for high school students interested in careers in this field are home economics, speech, English, health, mathematics, chemistry, and the social sciences.

Home economists frequently gain experience as teachers and advance to positions in business, extension service work, and teacher education.

Employment Outlook

Home economists, especially those wishing to teach in high schools, will face keen competition for jobs through the mid-1980's. Other areas of home economics also will experience competitive job market conditions as those unable to find teaching jobs look for other positions. However, for those willing to continue their education toward an advanced degree, employment prospects in college and university teaching are expected to be good.

Although employment of home economists is expected to grow more slowly than the average for all occupations, many jobs will become available each year to replace those who die, retire, or leave the field for other reasons. Growth will result from increasing awareness of the contributions that can be made by professionally trained home economists in quality child care, nutrition, housing and furnishings design, consumer education, and ecology. They also will be needed to promote home products, to act as consultants to consumers, and to do research for improvement of home products and services. The Vocational Education Amendments of 1968, which provide funds for consumer and homemaking education at the secondary, postsecondary, and adult levels, and focus on the needs of low-income families, should further stimulate the need for home economists.

Earnings and Working Conditions

Home economics teachers in public schools generally receive the same salaries as other teachers. In 1974, the average starting salary of public school teachers with a bachelor's degree was $7,700, according to a National Education Association survey. Public school teachers with a master's degree received average starting salaries of $8,600. Experienced teachers averaged $11,800. Median salaries of women teaching in colleges and universities in 1974 ranged from $9,700 for instructors to $18,200 for professors.

The Federal Government paid home economists with bachelor's degrees starting salaries of $8,500 and $10,500 in late 1974, depending on their scholastic record. Those with additional education and experience generally earned from $12,800 to $21,800 or more, depending on the type of position and level of responsibility. In late 1974, the Federal Government paid experienced home economists average salaries of $19,100 a year.

Cooperative Extension Service workers on the county level averaged $11,800 while those on the State level averaged $16,400 in 1974. In general, home economists earn about one and one-half times as much as the average for all nonsupervisory workers in private industry, except farming.

Home economists usually work a 40-hour week. Those in teaching and extension service positions, however, frequently work longer hours because they are expected to be available for evening lectures, demonstrations, and other work. Most home economists receive fringe benefits, such as paid vacation, sick leave, retirement pay, and insurance benefits.

Sources of Additional Information

A list of schools granting degrees in home economics and additional information about home economics careers, the types of home economics majors offered in each school granting degrees in home economics, and graduate scholarships are available from:

American Home Economics Association, 2010 Massachusetts Ave. NW., Washington, D.C. 20036

RECREATION WORKERS

(D.O.T. 079.128, 159.228, 187.118, 195.168, 195.228)

Nature of the Work

Participation in organized recreation activities has become an integral part of the increasing leisure time enjoyed by many Americans. Recreation workers plan, organize,

and direct individual and group recreation activities to help people better enjoy their nonworking hours.

. Recreation workers organize and lead social, cultural, and physical education programs at community centers, hospitals, workplaces, camps, and playgrounds for people of various ages and interests. They also manage recreation facilities and study the recreation needs of groups and communities. There are several basic types of recreation workers: recreation directors, supervisors, leaders, and activity specialists.

Recreation directors are responsible for the management and administration of recreation programs. They may evaluate the recreation needs of the population they serve, and plan activities according to these needs. They also hire personnel and prepare an operating budget. Particularly in smaller recreation programs, the director also may directly supervise various activities.

Recreation supervisors may plan recreation activities or assist the director in doing this. They then implement these activities, oversee their operation, and evaluate their success. They supervise the recreation leaders, activity specialists, and maintenance workers, and instruct them in many of the skills required to efficiently run a recreation program.

Recreation leaders work directly with the participants in recreation programs and are responsible for the program's day-to-day operation. They may give instruction in crafts, games, sports, and other activities and keep reports and records relating to these activities.

Recreation leaders who give instruction in specialties such as art, music, drama, swimming, or tennis are called *activity specialists*. They often conduct classes and coach teams in the activity in which they specialize. A camp counselor is generally a recreation leader and may also be an activity specialist. Recreation leaders usually work under the direction of a supervisor.

The services of recreation workers are used in many different settings. Recreation personnel employed by local government and voluntary agencies provide leisure-time activities at neighborhood playgrounds and indoor recreation centers. They furnish instruction in the arts, crafts, and in sports. They may supervise recreational activities at correctional institutions and work closely with social workers to organize programs for the young and the aged. School recreation staff organize the leisure-time activities of school-age children during schooldays, weekends, and vacations.

Under the supervision of a camp director, recreation leaders and activity specialists lead and instruct campers in nature-oriented forms of recreation such as swimming, hiking, and horseback riding, as well as arts, crafts, and other sports. Some camps provide campers with specialized instruction in a particular area such as music, drama, gymnastics, or tennis. In resident camps, the staff also must insure that the campers have adequate living conditions.

Recreation personnel in industry and in the Armed Forces organize and direct recreation rooms, athletic programs such as bowling and softball leagues, social functions, and other leisure activities for company employees and service men and women.

Therapeutic recreation is a specialized field within the recreation profession. It provides recreational services to aid in recovery or adjustment to illness, disability, or a

specific social problem. Recreation specialists may work with the physically handicapped in a school or rehabilitation center, with mentally ill or retarded persons in a public or private institution, or with juvenile delinquents, older citizens, or disabled veterans. The jobs in this specialty are largely comparable to those for recreation workers in other settings.

Places of Employment

More than 65,000 recreation workers were employed year-round in 1974; nearly one-half of them were women. Government recreation departments employed about one-half, primarily in local recreation departments. Many others worked for schools, commercial recreation establishments like camps or resort hotels, and nonprofit voluntary organizations such as athletic or scouting organizations, churches, and community organizations.

Over two-fifths of all year-round recreation workers are employed part time. Many of these are students who work for local government recreation programs. An additional 100,000 recreation workers were employed for the summer months only, during 1974. Seasonal workers are mostly college students and teachers who work primarily as recreation leaders and camp counselors.

Recreation workers are employed mostly in urban areas where many people must use the same playgrounds and recreation centers. Camp recreation workers, however, often work in rural, less populated areas of the country. Camp recreation workers are employed at resident, day, family, and travel camps. Except for the directors of very large camps and workers at the few camps which remain open year-round, camp recreation workers generally are employed for 2 or 3 months only during the summer.

Training, Other Qualifications, and Advancement

Formal training in a college recreation curriculum is becoming increasingly important for those seeking a career in recreation.

Recreation directors generally should have a bachelor's degree, preferably in recreation, as well as considerable experience. Advanced courses leading to a master's degree often are desirable for persons interested in higher level administrative positions and are usually necessary for teaching at a college or university. Those with a bachelor's degree usually begin as supervisors or recreation leaders, and may advance to a director position.

A high school education is generally the minimum requirement for recreation leaders. However, an associate degree in recreation or a related subject from a community or junior college usually is preferred for both year-round and seasonal employment. In addition, those with college training generally start at a higher salary and have better advancement opportunities. Activity specialists must have specialized training in a particular field, such as art, music, drama, or athletics. In most cases, an associate degree in recreation with a concentration in one of these areas or a bachelor's degree in recreation or one of the arts is necessary for year-round employment. In general, camps prefer those with some college background to work as counselors or activity specialists.

In March 1974, 200 community colleges and 186 4-year colleges and universities had recreation and parks curriculums. In addition, 92 graduate programs were offered. The typical program of recreation study includes courses in communications, natural sciences, the humanities, philosophy, sociology, psychology, drama, and music. Specific courses in recreation include group leadership, program planning and organization, health and safety procedures, outdoor and indoor sports, dance, arts and crafts, and field work in which the student obtains actual recreation leadership experience. Students interested in industrial or other types of commercial recreation may find it desirable to take courses in business administration; those interested in therapeutic recreation should take courses in psychology, health education, and sociology.

Young people planning careers as recreation workers must have the ability to motivate people and be sensitive to their needs. Good health and physical stamina often are required. Activity planning frequently calls for creativity and resourcefulness. Recreation workers should be able to accept responsibility and exercise judgment since they usually work alone. To increase their leadership skills and understanding of people, students should obtain related work experience in high school and college. They may do volunteer, part-time, or summer work in recreation departments, camps, youth-serving organizations, institutions, and community centers.

After a few years experience, recreation leaders or activity specialists may become recreation supervisors. Although promotions to administrative positions may be easier for persons with graduate training, advancement is usually possible through a combination of education and experience.

Employment Outlook

The employment of recreation workers is expected to rise faster than the average for all occupations through the mid-1980's as public pressure for recreation areas results in the creation of many new parks, playgrounds, and national forests. Increased attention to physical fitness by government, educators, and others may produce a rise in public and industrial recreation programs. Longer life and earlier retirements also will increase the demand for

recreation programs for retired persons. All of these factors will increase the need for recreation workers and stimulate growth in the occupation.

The level of formal education and amount of related work experience will become increasingly important as more recreation graduates compete for positions. Those with a 2-year degree or less will generally be limited in advancement opportunities. Those with a bachelor's degree should have a favorable employment outlook, with increasing competition during economic slowdowns when recreation employment in both the public and private sectors may be adversely affected. Opportunities for those with a master's or Ph. D. degree should be good in teaching, supervisory, and administrative positions.

Job experience prior to graduation will greatly help a graduate find a position. Applicants with the most related job experience will receive the more responsible and higher paying positions.

Many opportunities will be available for part-time and summer employment as recreation leaders and assistants in local government recreation programs. Many of the summer jobs will be for counselors and activity specialists in camps.

Earnings and Working Conditions

Starting salaries for recreation leaders with a bachelor's degree in State and local governments averaged about $8,000 in 1974, according to a survey by the Public Personnel Association. There was a wide salary range among employers—in general, salaries were highest in the west and lowest in the south. Average earnings for recreation workers are higher than those for nonsupervisory workers in private industry, except in farming. According to the National Recreation and Park Association, recreation workers with a 2-year degree usually started at about $6,500 in 1974; those with a bachelor's degree, about $8,000; with a master's degree, $9,-10,000; with a Ph. D., $11-12,000. A person with at least a bachelor's degree and considerable (5-6 years) experience averaged about $14-15,000. Recreation directors' salaries ranged from $11,000 to more than $20,000 depending on their responsibilities.

Starting salaries for recreation workers in the Federal Government in late 1974 were $8,500 for applicants having a bachelor's degree; $10,500 with a bachelor's degree plus 1 year experience; $12,841 with a bachelor's plus 2 years experience or a master's degree; and $15,481 with a bachelor's plus 3 years experience or a Ph. D.

The average week for recreation personnel is 35-40 hours. Many camp recreation workers live at the camps where they work, and their room and board is included in their salaries. Most public and private recreation agencies provide from 2 to 4 weeks vacation and other fringe benefits such as sick leave and hospital insurance.

A person entering the recreation field should expect some night work and irregular hours since they often work while others are enjoying leisure time. Recreation workers often spend much of their time outdoors when the weather permits.

Sources of Additional Information

Information about recreation as a career, employment opportunities in the field, and colleges and universities offering recreation curriculums is available from:

National Industrial Recreation Association, 20 North Wacker Dr., Chicago, Ill. 60606.

National Recreation and Parks Association, 1601 North Kent St., Arlington, Va. 22209.

For information on careers in camping and job referrals, contact:

American Camping Association, Bradford Woods, Martinsville, Ind. 46151.

SOCIAL SERVICE AIDES

Nature of the Work

Social service or human service aides enable social service agencies to help greater numbers of people by providing services which supplement the work of professional social workers and rehabilitation counselors. Most social service aides work under the close guidance and supervision of other professional staff.

Social service aides serve as a link between professional social workers or rehabilitation counselors and people who seek help from social agencies. Aides explain the services and facilities of the agency and help new applicants fill out any required forms. In some agencies, aides visit the client's home, interview friends and relatives, and check documents such as marriage licenses or birth certificates to determine an individual's or family's eligibility for financial assistance or other services.

Much of the routine paperwork required in welfare programs may be done by social service aides. They may keep records on clients up to date, maintain a filing system of reports or a control system for periodic case reviews, and fill out school enrollment, employment, medical, and compensation forms.

Due to the wide variety of social services, social service aides work in many different job settings and perform a range of different job functions. Aides usually referred to as *casework aides* or *assistants*, often work directly with clients. They may help clients locate and obtain adequate housing, find jobs, or counsel parents about their children's dress and appearance. Casework aides serve as advocates

for clients by going with them to clinics to insure that they receive needed medical care or by helping them effectively communicate their needs to institutions that provide educational or welfare services.

Homemaker aides help clients improve their skills in shopping, cleaning, sewing, budgeting, family health and hygiene, child care, and meal planning and preparation. They are assigned to a home for 1 day or more a week, or instruct groups of adults at a community or neighborhood center.

An important facet of the homemaker aide's work is the actual demonstration of homemaker skills. Stressing the importance of regularity and routine in the home, they set up a schedule of weekly activities. They get down to particulars of housekeeping by teaching homemakers how to clean stoves and refrigerators, prepare meals from leftovers, or recognize a bargain in inexpensive material for clothing. They encourage homemakers to take advantage of cost-saving opportunities such as the barber school for haircuts, the thrift shop, surplus foods, and free recreation. In addition to teaching domestic skills, some homemaker aides also help clients obtain needed social services and may do housekeeping chores during a parent's illness.

Some workers called *neighborhood workers* personally contact the residents of an area to explain and discuss agency services. They learn the needs of individuals and families and refer routine cases to a counselor or to the appropriate community service agency. They report more difficult problems to a supervisor. Neighborhood workers may inform residents about job openings, available housing, job training opportunities, and public services. On a broader scale, they assist in the organization of block and other neighborhood groups to conduct programs that benefit the neighborhood, foster a sense of community responsibility among residents, and encourage participation in the anti-poverty programs of social service agencies. They also may assist in routine neighborhood surveys and counts, keep records, and prepare reports of their activities for the supervisor.

Employment aides actively seek out the disadvantaged and help prepare them for employment by giving them assistance in getting special training and counseling. Working in neighborhood centers or mobile units, they locate candidates for available jobs and training programs by contacting unemployed residents in pool rooms, laundromats, and street corners or through employment or welfare agency referrals. They give the unemployed information about the services of the local State employment service office, available job and training opportunities, and help them fill out the necessary application forms. After clients are employed, aides maintain contact to help workers adjust to the new work environment and to iron out minor difficulties.

Another occupation that has much in common with social service aides is *child care aide*. They help care for children of working mothers at child development facilities and day care centers. Child care aides feed, entertain, and otherwise care for children who are usually too young to attend school. Under the direction of social workers, teachers, and other professionals, they help children develop socially and prepare for elementary school. Aides also may teach children counting, arithmetic, art, music, and other subjects that stimulate their curiosity and ability to think. In addition, they may work along with the child's family to help insure that the child is adequately fed and clothed and receives regular medical and dental care.

Apart from these specific duties, the most useful functions of social service aides are to be available when needed to offer encouragement and counsel, and to act as advocates for the needs of those in the community which they serve.

Places of Employment

About 70,000 people worked as social service aides in 1974; approximately 4 out of 5 were women. Most work in the inner cities of large metropolitan areas.

More than half of all social service aides work for government departments and agencies primarily on the State and local levels. They work for community and neighborhood organizations and centers, welfare and social service agencies, residential welfare facilities for children or adults, and rehabilitation agencies serving the blind, disabled, and otherwise disadvantaged.

Training, Other Qualifications, and Advancement

Graduation from high school generally is not required for social service aide jobs. Employers do not always look for the most highly skilled applicants. An individual's need for work, as well as potential for upgrading his or her skills and making a useful contribution to the agency, often is considered. For employment in some agencies, an examination or registration on a civil service list may be required.

Persons seeking jobs as social service aides should get along well with people and be able to work as part of a team. They should be tactful, courteous, and want to help others.

Homemaker aides should be persons who have demonstrated competence in managing a home and rearing children. Workers assigned to Puerto Rican or Mexican-American communities should speak and understand Spanish. Some social service aide jobs require typing skills.

Most employers emphasize the development of career ladders with opportunities for advancement through a combination of on-the-job training, work experience, and further education. Aides usually are trained on the job from 1 to several months. Those without high school diplomas often receive classroom instruction to help them pass a high school equivalency examination. Entry level positions as employment aides can lead to a job as an employment interviewer, and, after special training, to employment counselor. Employing agencies frequently pay part of the cost of further education for social services aides.

Employment Outlook

Employment of social service aides is expected to grow much faster than the average for all occupations through the mid-1980's. Many opportunities are expected for part-time work. A large number of openings will arise from the need to replace aides who die, retire, or transfer to other jobs.

Employment in this field will stem from population growth, coupled with this country's continuing commitment to aid those who are disadvantaged, disabled, or unable to care for themselves. In addition, as social welfare services and programs expand, social service aides increasingly will be used for much of the routine and less responsible work now done by professional personnel.

Earnings and Working Conditions

Full-time social service aides with no prior experience or minimum education earned salaries ranging from $5,000 to $6,500 a year in 1974. Those with experience or additional education usually earned more. The Federal Government paid beginning social service aides salaries of from $5,294 to $8,500 in late 1974 depending upon their education and prior work experience; experienced aides earned as much as $10,520. Many aides in both public and private agencies work part time and earn less.

Although they work much of the time in offices of social service departments and agencies, they may frequently visit the homes of clients or offices of other social service agencies, hospitals, and business establishments. Aides often must work evenings or weekends when clients can be reached.

Sources of Additional Information

Information on requirements for social service aide jobs is available from city, county, or State departments of welfare or social services, community or neighborhood development agencies, and local offices of the State employment service.

SOCIAL WORKERS

(D.O.T. 195.108, .118, .168, and .208, .228)

Nature of the Work

The ability of people to live effectively in society is often hampered by problems that range from personal ones to those arising from social unrest within a group or community. These problems, aggravated by the growing complexity of society, have greatly increased the need for social services. Social workers assist individuals, families, groups and communities in using these services to solve their problems.

The three basic approaches to social work are casework, group work, and community organization. The approach chosen is usually determined by the nature of the problem and the time and resources available for solving it. Social workers often combine these approaches in dealing with a specific problem.

In casework, social workers use interviews to identify the problems of individuals and families. They then help people to understand and solve their problems and to secure needed services, education, or job training. In group work, social workers help people to understand both themselves and others better, to overcome racial and cultural prejudices, and to work together with others in achieving a common goal. They plan and conduct group activities for children, adolescents, older persons and other adults in a variety of settings such as settlement houses, hospitals, homes for the aged, and correctional institutions. In community organization, social workers coodinate the efforts of groups, such as political, civic, religious, business, and union organizations, to combat social problems through community programs. For a neighborhood or larger area, they may help plan and develop health, housing, welfare, and recreation services. They often coordinate existing social services and organize fund raising for community social welfare activities.

The majority of social workers provide social services directly to individuals, families, or groups. However, a substantial number are executives, administrators, or supervisors. Others are college teachers, research workers, con-

sultants, or private practitioners.

Social workers can apply their training and experience in a variety of social service settings.

Social workers in family service positions in State and local government offices and voluntary agencies provide counseling and social services that strengthen personal relationships and help clients to improve their social functioning. They also advise their clients on the constructive use of financial assistance and other social services.

Social workers in child welfare positions work to improve the physical and emotional well-being of deprived and troubled children and youth. They may advise parents on child care and child rearing, counsel children and youth with social adjustment difficulties, arrange homemaker services during a parent's illness, institute legal action for the protection of neglected or mistreated children, provide services to unmarried parents, and counsel couples who wish to adopt children. After making appropriate case evaluations and home studies, they may place children in suitable adoption or foster homes or in specialized institutions.

School social workers aid children whose unsatisfactory school progress is related to their social problems. These workers consult and work with parents, teachers, counselors, and other school personnel to identify and solve problems that hinder satisfactory adjustment.

Social workers in medical and psychiatric settings such as hospitals, clinics, mental health agencies, rehabilitation centers, and public welfare agencies aid patients and their families with social problems accompanying illness, recovery, and rehabilitation. As members of medical teams, they help patients respond to treatment and guide them in their readjustment to their homes, jobs, and communities. (The related occupation of rehabilitation counselor is discussed in a separate statement.)

Probation and parole officers and other social workers engaged in correctional programs help offenders and persons on probation and parole readjust to society. They counsel on social problems encountered in relation to their return to family and community life. Probation and parole officers also may help secure necessary education, training, employment, or community services.

In addition, the services of social workers are being sought in many fields where they have not been used significantly in the past. These include private practice (as counselors), industrial social work, drug and alcohol abuse counseling, and city and social policy planning.

Places of Employment

About 300,000 social workers were employed in 1974; nearly two-thirds of them were women. State, county, and city government agencies employ about two-thirds of all social workers; about 3,000 work for the Federal Government. Most of the remainder work for voluntary or private agencies, schools, hospitals, and other medical establishments. Although employment is concentrated in urban areas, many work with rural families. A small number of social workers—employed by the Federal Government and the United Nations or one of its affiliated agencies—serve in other parts of the world as consultants, teachers, or technicians and establish agencies, schools, or assistance programs.

Training, Other Qualifications, and Advancement

In recent years, there has been a growing acceptance of the bachelor's degree in social work (BSW), rather than the master's degree (MSW), as the minimum education of the professional social worker. The BSW programs generally offer an introduction to the social welfare system, the skills

and values of social work, and supervised field experience. Although the BSW is preferred, many employers will accept a bachelor's degree in another field as an acceptable level of education.

For many positions, a master's degree in social work is preferred or required. Two years of specialized study and supervised field instruction are generally required to earn an MSW. Previous training in social work is not required for entry into a graduate program, but courses in related fields such as psychology, sociology, economics, political science, history, and social anthropology, as well as social work, are recommended. Some graduate schools recently have established 1-year MSW programs for well-qualified BSW recipients. In 1974, 86 colleges and universities offered accredited graduate programs in social work.

Scholarships and fellowships are available for graduate education. Some social welfare agencies, both voluntary and public, offer plans whereby workers are granted 'educational leave' to obtain graduate education. The agency may pay the expenses or a salary, or both.

A graduate degree and experience are generally required for supervisory, administrative, or research work, the last also requiring training in social science research methods. For teaching positions, an MSW is required and a doctorate usually is preferred. In most State and many local government agencies, applicants for employment must pass a written exam, particularly at the bachelor's level.

At the end of 1974, 14 States had licensing or registration laws providing for the use of professional social work titles by those who qualify. Usually work experience, an examination, or both, are necessary for licensing or registration, with periodic renewal required. The National Association of Social Workers allows the use of the title ACSW (Academy of Certified Social Workers) for those members having at least 2 years of post-master's job experience who have passed the ACSW examination.

Social workers should be emotionally mature, objective, and sensitive and should possess a basic concern for people and their problems. They must be able to handle responsibility, work independently, and form and sustain good working relationships with clients and co-workers.

Students should obtain as much related work experience as possible during high school and college to determine whether they have the interest and capacity for professional social work. They may do volunteer, part-time, or summer work in places such as camps, settlement houses, hospitals, community centers, or social welfare agencies. Some voluntary and public social welfare agencies hire students for jobs in which they assist social workers.

Employment Outlook

Employment opportunities for persons having bachelor's degrees in social welfare or related fields should be favorable through the remainder of the 1970's and into the 1980's. The outlook for graduates of master's degree programs in social work is expected to continue to be good through the mid-1980's. However, if the number of students graduating from social work programs continue to increase at the same rate as in the 1960's and early 1970's, competition for some positions will become stronger. At both the bachelor's and master's levels, it is possible that in certain geographic areas there will be greater job competition.

Employment of social workers is expected to increase faster than the average for all occupations through the mid-1980's. Many new positions will come from the expansion of community mental health centers, and growth of the newer social work services such as drug and alcohol abuse counseling and city and policy planning. Also, as the occupational structure of the economy continues to change, problems may be created for unskilled and displaced workers. This, coupled with the problems caused by social change, is expected to maintain a strong demand for persons in the social service field.

Earnings and Working Conditions

Salaries for social workers at all levels vary greatly by type of agency (private or public, Federal, State, or local) and geographic region. Salaries are generally highest in large cities and in States with sizable urban populations. In 1974, social workers with a bachelor's degree usually started at about $8,000-$8,500; with a master's degree, between $9,500 and $11,000. Salaries for experienced MSW social workers averaged $12,000-15,000 a year. Private practitioners and those in administration, teaching, and research often earn considerably more.

In the Federal Government, social workers with an MSW and no experience usually started at about $10,500 in late 1974. Graduates with an MSW and no work experience may start at $12,800 if they are well qualified for the position; with an MSW and 1 year of experience, usually at $12,800; with an MSW and 2 years of experience, at almost $15,500.

Men and women without graduate training in social work are generally limited in the advancement opportunities available to them, since most supervisory and administrative positions are staffed by master's degree recipients.

Most social workers have a 5-day, 35-40-hour week. However, many, particularly in private agencies, work part time. In some agencies, the nature of the duties requires some evening and

weekend work, for which compensatory time off is given. Most social work agencies provide fringe benefits such as paid vacation, sick leave, and retirement plans.

Sources of Additional Information

For information about career opportunities in the various fields of social work, contact:

National Association of Social Workers, 15th and H St. NW., 600 Southern Building, Washington, D.C. 20005.

Information on accredited graduate and undergraduate college programs in social work is available from:

Council on Social Work Education, 345 East 46th St., New York, N.Y. 10017.

ART, DESIGN, AND COMMUNICATIONS RELATED OCCUPATIONS

Creativity and the ability to communicate ideas are prerequisites for work in occupations related to art, design, and communications. For example, an architect's blueprint is the embryo of a building; floral designers express a mood of love, sympathy, or other emotion in a flower arrangement; and actors project a character on the stage or screen for the enjoyment of their audiences. Newspaper reporters communicate newsworthy events to their reading audiences; dancers express emotion, mood, or thought through physical movements; and photographers capture an emotion or idea through camera angle, lighting, and the flick of a shutter.

This section of the *Handbook* describes in detail occupations that require creative and communicative talents: the performing arts—actors, dancers, singers, and musicians; the design occupations—architects, urban planners, and seven other related occupations; and communications related Occupations—interpreters, newspaper reporters, technical writers, and radio and TV announcers.

PERFORMING ARTISTS

The performing arts include music, acting, singing, and the dance. In these fields, the number of talented persons seeking employment generally greatly exceeds the number of full-time positions available. As a result, many performers supplement their incomes by teaching, and others work much of the time in different types of occupations.

The difficulty of earning a living as a performer is one fact young persons should remember when they consider such a career. They should consider, therefore, the possible advantages of making their art a hobby rather than a profession. Aspiring young artists usually must spend many years in intensive training and practice before they are ready for public performances. They not only need great natural talent but also determination, a willingness to work long and hard, and an overwhelming interest in their chosen field, and some luck.

The statements which follow this introduction give detailed information on musicians, singers, actors, and dancers.

ACTORS AND ACTRESSES

(D.O.T. 150.028 and 150.048)

Nature of the Work

Making a character come to life before an audience is a job that has great glamour and fascination. This demanding work requires special talent and involves many difficulties and uncertainties.

Only a few actors and actresses achieve recognition as stars on the stage, in motion pictures, or on television or radio. A somewhat larger number are well-known, experienced performers, who frequently are cast in supporting roles. However, most actors and actresses struggle for a toehold in the profession, and are glad to pick up parts wherever they can.

New actors generally start in "bit" parts where they speak only a few lines. If successful, they may progress to larger, supporting roles, of which there are several in most stage, television, and screen productions. They also may serve as understudies for the principals.

Actors who prepare for stage, screen, and television roles rehearse many hours. They must memorize their lines and know their cues.

In addition to the actors and actresses with speaking parts, "extras," who have no lines to deliver, are used in various ways in almost all motion pictures and many television shows and theatre productions. In "spectacular" productions, a large number of extras take part in crowd scenes.

Some actors find alternative jobs as coaches of drama or directors of stage, television, radio, or motion pictures productions. A few teach in drama departments of colleges and universities.

Places of Employment

About 10,000 actors and actresses work in stage plays, motion pictures (including films made especially for television), industrial shows and commercials.

In the winter, most employment opportunities on the stage are in New York and other large cities. About 400 actors and actresses worked on Broadway in 1974. In the summer, stock companies in suburban and resort areas provide employment. In addition, many cities now have—"little theatres," repertory companies and dinner theatres, which provide opportunities for local talent as well as for professional actors and actresses. Normally plays are produced and casts selected in New York City for shows that go "on the road."

Employment in motion pictures and film television is essentially centered in Hollywood and New York City, although a few studios are located in Miami and other parts of the country. In addition, many films are shot on location, and employ local nonprofessionals as "extras." A number of American-produced films are being shot in foreign countries. In television,

most opportunities for actors are at the headquarters of the major networks—in New York, Los Angeles, and, to a lesser extent, Chicago. A few local television stations occasionally employ actors.

Training, and Other Qualifications

Young persons who aspire to acting careers should take part in high school and college plays, or work with little theatres and other acting groups for experience.

Formal training in acting which is increasingly necessary, can be obtained at dramatic art schools, located chiefly in New York, and in more than 1,600 colleges and universities throughout the country. College drama curriculums usually include courses in liberal arts, speech, pantomime, directing, playwriting, play production, and history of the drama, as well as practical courses in acting. From these, the student develops an appreciation of the great plays and a greater understanding of the roles he may be called on to play. Graduate degrees in fine arts or drama are needed for college teaching positions.

Acting demands patience and total commitment, since aspiring actors and actresses must wait for parts or filming schedules, work long hours, and often do much traveling. Flawless performances require long rehearsal schedules and the tedious memorizing of lines. The actor needs stamina to withstand the heat of stage or studio lights, or the adverse weather conditions which may exist "on location." Above all, young persons who plan to pursue an acting career must have talent and the creative ability to portray different characters. They must have poise, stage presence, and aggressiveness to project themselves to the audience. At the same time, the ability to follow directions is important.

In all media, the best way to start is to use local opportunities and to build on the basis of such experience. Many actors successful in local productions eventually try to appear on the New York stage. Inexperienced actors find it extremely difficult to obtain employment in New York or Hollywood particularly in the motion picture field where employment often results from previous experience on Broadway.

To become a movie extra, one must usually be listed by Central Casting, a no-fee agency which works with the Screen Extras Guild and supplies all extras to the major movie studios in Hollywood. Applicants are accepted only when the number of persons of a particular type on the list—for example, athletic young men, old ladies, or small children—is below the foreseeable need. In recent years, only a very small proportion of the total number of applicants have succeeded in being listed. Extras have very little opportunity to advance to speaking roles.

The length of an actor's or actresses' working life depends largely on skill and versatility. Great actors and actresses can work almost indefinitely. On the other hand, employment becomes increasingly limited by middle age, especially for those who become typed in romantic, youthful roles. Due to the factors disccussed, persons who intend to pursue an acting career may find unstable employment conditions and financial pressures.

Employment Outlook

Overcrowding has existed in the acting field for many years and this condition is expected to persist. In the legitimate theater, motion pictures, radio, and television, job applicants greatly exceed the jobs available. Moreover, many actors are employed in their profession for only a part of the year.

Motion pictures and TV have greatly reduced employment opportunities for actors in the theater. Although a motion picture production may use a very large number of actors, during filming, films are widely distributed and may be used for years. Also, some American-produced films are shot in foreign countries resulting in reduced employment opportunites for American actors and actresses. Television employs a large number of actors on TV programs and commercials. However, employment on this media has been reduced by the FCC ruling that decreased major TV network prime time programming. Local stations often substitute with low cost game shows that employ few actors or reruns. Also, the trend toward 1 to 2-hour programs, and more reruns shortens the period of employment and reduces the number of persons needed.

One possibility for future growth in the legitimate theater lies in the establishment of year-round professional acting companies in cities. The number of such acting groups is growing. The recent growth of summer and winter stock companies, outdoor and regional theatre, repertory companies, and dinner theaters also has increased employment opportunities. Dinner theatres represent the fastest growing area of employment in the country for actors. Also, a possible growth in "Off-Broadway" theatre could result from the recent seating capacity expansion. In addition, some increases may be likely in the employment of actors on television in response to expansion of the Public Broadcasting System, UHF stations, and cable TV. The development and wider use of video cassettes also may result in some employment opportunities. These media will have a positive influence on employment if original material and programs result, not reruns or old movies.

Though the field of acting as a whole is expected to grow faster than the average for all occupa-

tions, through the mid-1980's, the number of persons who want to enter the profession is expected to be greater than employment opportunities. Even highly talented young people are likely to face stiff competition and economic difficulties.

Earnings and Working Conditions

Actors and actresses in the legitimate theater belong to the Actors' Equity Association, in motion pictures, including television films, to the Screen Actors Guild, Inc., or to the Screen Extras Guild, Inc., in television or radio, to the American Federation of Television and Radio Artists (AFTRA). These unions and the show producers sign basic collective bargaining agreements which set minimum salaries, hours of work, and other conditions of employment. Each actor also signs a separate contract which may provide for higher salaries than those specified in the basic agreement.

The minimum weekly salary for actors in Broadway productions was about $245 in 1974. Those in small "off-Broadway" theaters received a minimum of $137.50 to $210 a week depending on the theater's gross receipts. For shows on the road, the minimum rate was about $347.50 a week. (All minimum salaries are adjusted upward automatically, by union contract, commensurate with increases in the cost of living as reflected in the Bureau of Labor Statistics Consumer Price Index.)

In 1974, motion picture and television actors and actresses earned a minimum daily rate of $172.50, or $604 for a 5-day week. For extras, the minimum rate was $46 a day. Actors and actresses who did not work on prime time network television received a minimum program fee of about $203.50 for a single half-hour program and 8 hours of rehearsal time. Because of the frequent periods of unemployment, characteristic of this profession, annual earnings may be low for many lesser-known performers. According to a recent survey by the Screen Actors Guild, three-quarters of their members earned less than $3,500 a year; only 3 percent earned more than $25,000 a year. In all fields, many well-known actors and actresses have salary rates above the minimums. Salaries of the few top stars are many times the figures cited.

Eight performances amount to a week's work on the legitimate stage, and any additional performances are paid for as overtime. After the show opens, the basic workweek is 36 hours, including 12 hours for rehearsals. Before it opens, however, the workweek usually is longer to allow time for rehearsals. Evening work is, of course, a regular part of a stage actor's life. Rehearsals may be held late at night and on weekends and holidays. When plays are on the road, weekend traveling often is necessary.

Most actors are covered by a pension fund and a growing number have hospitalization insurance to which employers contribute. All Equity and AFTRA members have paid vacations and sick leave. Most stage actors get little if any unemployment compensation solely from acting since they seldom have enough employment in any State to meet the eligibility requirements. Consequently, when a show closes, and while waiting for another role they often have to take any casual work obtainable.

Sources of Additional Information

Information on colleges and universities and conservatories which offer a major in drama is available from:

American Educational Theater Association, 1317 F St. NW., Washington, D.C. 20004.

DANCERS

(D.O.T. 151.028 and 151.048)

Nature of the Work

Dancing is an ancient and worldwide art that has many different forms. Professional dancers may perform in classical ballet or modern dance, in dance adaptations for musical shows, in folk dances, and in other popular kinds of dancing. In classical ballet, movements are based on certain conventional or styled "positions," and women dance "en point" (on the tips of their toes). In modern dance, movements are more varied but are nonetheless carefully planned and executed to follow a pattern.

In dance productions, performers most often work as a corps de ballet (chorus). However, a group of selected dancers may do special numbers, and a very few top artists do solo work.

Many dancers combine stage work with full-time teaching. The few dancers who become choreographers create new ballet or dance routines. Others are dance directors who train dancers in new productions.

(This statement does not include instructors of ballroom, American or international folk dance and other social dancing.)

Places of Employment

About 7,000 dancers worked on the stage, screen, and television in 1974. Many more teach at schools of the dance and in other schools and colleges and universities. A few teachers, trained in dance therapy, work in mental hospitals. About 85 percent of all dancers are women, but in some types of dance, particularly ballet and modern, women constitute only about one-half of the performers.

Dance teachers are located chiefly in large cities, but many smaller cities and towns have schools of the dance. New York City is the hub for performing dancers.

Training and Other Qualifications

Serious training for a career in dancing traditionally begins by age 12 or earlier. For example, persons who wish to become ballet dancers should begin taking lessons at the age of 7 or 8. Two to 3 years of prior preparation is needed before the young girl should start dancing "enpointe." Ballet training requires from 10 to 12 lessons a week for 11 or 12 months in the year and many additional hours of practice. The length of the training period depends on the student's ability and physical development, but most dancers have their professional audition by age 17 or 18. Early and intense training is also important for the modern dancer.

The selection of a professional dancing school is important for (1) setting the pace of training, since too early and too severe exercise can permanently damage the legs and feet; and (2) for connections with producers may help the students obtain employment.

Because of the strenuous training a student's general education may not exceed the minimum. However, a dancer should study of music, literature, and history along with the arts to help in the interpretation of dramatic episodes and music. Also, more dancers are being trained in all forms of dance—ballet, ethnic, modern, and tap—for work on the professional stage or education.

About 200 colleges and universities confer bachelor's degrees on students who have majored in physical education and concentrated on the dance; majored in a dance; or majored in a dance program to prepare students as professional dance artists. Some schools also give graduate degrees.

A college education is an advantage in obtaining employment as a teacher of professional dancing or choreography. However, ballet dancers who postpone their first audition for openings in classical ballet until graduation may compete at a disadvantage with younger dancers.

Professional schools usually require teachers to have experience as a performer; colleges and conservatories generally require graduate degrees, but experience as a performer often may be substituted. Maturity and a broad educational background also are important.

The dancer's life is one of rigorous practice and self-discipline. Good health and physical stamina are necessary, both to keep in good condition and to follow the rugged travel schedule often required.

Body height and build should not vary much from the average. Good feet and normal arches also are required. Above all, one must have a natural aptitude for dancing, and a creative ability to express oneself through dance.

Seldom does a dancer perform unaccompanied. Therefore, young persons who consider dancing as a career should be able to function as part of a team. They also should be prepared to face the anxiety of unstable working conditions brought on by show closings and audition failures.

Except for outstanding stars, women past 30 are rarely hired by ballet companies, and women past 25 are rarely hired for Broadway shows unless they have had experience in such productions. Men in ballet and men and women in modern dance can usually work longer than other dancers. After the employable age for performers has passed, some dancers teach in colleges or conservatories or establish their own schools. The few who become choreographers or dance directors can continue to work as long as persons in other occupations.

Employment Outlook

The number seeking professional careers in dance will continue to exceed available positions, despite an expected faster than the average rate of growth in the employment of dancers.

Most openings in this relatively small occupation will result from replacement needs, and competition is expected to be keen. The best employment opportunities will be in teaching dance. Opportunities in stage production will be limited.

The number of stage productions is expected to decline due to increased competition from television and motion pictures, however, some jobs will be available in these media. Financial difficulties of domestic companies and competition from foreign dancers will reduce ballet employment. However, some performing dancers will find jobs in industrial exhibitions, art shows and state fairs. Others will work with new professional dance companies formed from the increasing number of civic and community dance groups.

Earnings and Working Conditions

Professional dancers who perform are members of one of the unions affiliated with the Associated Actors and Artists of America (AFL-CIO). Dancers in

opera ballet, classical ballet, and the modern dance belong to the American Guild of Musical Artists, Inc.; those on live or videotaped television belong to the American Federation of Television and Radio Artists; those perform in films, TV, and other forms of motion pictures belong to the Screen Actors Guild or the Screen Extras Guild; and those in musical comedies join Actors' Equity Association. Other dancers may be members of other unions, depending upon the fields in which they perform. The unions and producers sign basic agreements specifying minimum salary rates, hours of work, and other conditions of employment. The separate contract signed by each dancer with the producer of the show may be more favorable than the basic agreement regarding salary, hours of work, and working conditions.

In 1974, the minimum salary for dancers in ballet and other stage productions was about $240 a week. The single performance rate is about $75 for a solo dance and about $40 per dancer for a group. Dancers on tour received an allowance of $30 a day in 1974, to defray the cost of room and board. The employer pays the cost of transportation. For a brief appearance in a performance on television or a few days' work in a movie, the minimum rate is higher, relative to time worked. However, this difference is offset by the brevity of the engagement and the long period likely waiting for the next one. A few performers, of course, have much higher salaries.

Some dancers qualified to teach combine this work with engagements as performers. Many more dancers supplement their incomes by other types of work.

Salaries of ballet teachers vary with the location and prestige of the school. Dance teachers in college and universities are paid on the same basis as other faculty members. (See statement on "College and University Teachers.")

The normal workweek is 30 hours (5 hours per day maximum) spent in rehearsals and matinee and evening performances. Extra compensation is paid for additional hours worked. Most stage performances take place, of course, in the evening, and rehearsals require very long hours, often on weekends and holidays. For shows on the road, weekend travel often is required.

Dancers are entitled to some paid sick leave and various health and welfare benefits provided by their unions, to which the employers contribute.

Sources Of Additional Information

Information on colleges and universities and conservatories of music which give a major in the dance or some courses in the dance, as well as details on the types of courses and other pertinent information is available from the National Dance Association, a division of the American Alliance for Health, Physical Education and Recreation, 1201 16th St. NW., Washington, D.C. 20036.

MUSICIANS

(D.O.T. 152.028 and 152.048)

Nature of the Work

Professional musicians—whether they play in a symphony orchestra, dance band, rock group, or jazz combo—generally have behind them many years of formal or informal study and practice. As a rule, musicians specialize in either popular or classical music; only a few play both types professionally.

Musicians who specialize in popular music usually play the trumpet, trombone, clarinet, saxophone, organ, or one of the "rhythm" instruments—the piano, string bass, drums, or guitar. Dance bands play in nightclubs, restaurants, and at special parties. The best known bands, jazz groups, rock groups, and solo performers sometimes give concerts and perform on television.

Classical musicians play in symphonies, opera and theater orchestras, and for other groups that require orchestral accompaniments. Most of these musicians play strings, brass, or woodwinds instruments. Some form small groups—usually a string quartet or a trio—to give concerts of chamber music. Many pianists accompany vocal or instrumental soloists, choral groups or provide background music in restaurants or other places. Most organists play in churches; often they direct the choir.

A few exceptionally brilliant musicians give their own concerts and appear as soloists with symphony orchestras. Both classical and popular musicians make individual and group recordings.

A very high proportion of all musicians teach instrumental and vocal music in schools and colleges. Some direct vocal and instrumental music, teach music appreciation, and give group instruction on an instrument in elementary and secondary school. Many public school teachers and performing musicians, give private lessons in their own studios or in pupil's homes.

A few musicians work in the field of music therapy in hospitals, and in music libraries.

Places of Employment

About 85,000 persons worked as performing musicians in 1974. Many thousands more taught in elementary and secondary schools and in colleges and universities. Almost every town and city has at least one private music teacher.

Most professional musicians who perform work in cities where entertainment and recording activities are concentrated, such as New

York, Chicago, Los Angeles, Nashville, Miami Beach, and New Orleans. Many perform with one of the 28 major symphonies, 88 metropolitan, or 1,100 community orchestras. Many communities have orchestras and dance bands, but in the small towns such work is usually part time.

In addition, thousands of qualified instrumentalists have other full-time jobs and only occasionally work as musicians in dance bands, that are hired to play at private parties or for special occasions. Classical musicians occasionally play in an orchestra, become conductors or composers, or do some part-time teaching.

Training and Other Qualifications

Most people who become professional musicians begin studying an instrument at an early age. To acquire great technical skill, a thorough knowledge of music, and the ability to interpret music, young people need intensive training through private study with an accomplished musician, in a college or university which has a strong music program, or in a conservatory of music. For advanced study in one of these institutions an audition frequently is necessary. Many teachers in these schools are accomplished artists who will train only promising young musicians.

More than 700 conservatories and colleges and universities offer a bachelor's degree program in music education to qualify graduates for the State certificate for elementary and secondary school teaching positions. Over 400 conservatories and collegiate music schools have been accredited by the National Association of Schools of Music to award the degree of bachelor of music to students who major in instrumental or vocal music. These programs provide training in musical performance, history and theory, and some liberal arts courses. College teaching positions usually require advanced degrees but exceptions may be made for well-qualified artists.

Musicians who play jazz and other popular music must have an understanding of and feeling for that style of music, but classical training may expand their employment opportunities. As a rule, they take lessons with private teachers when young, and seize every opportunity to play in amateur or professional performances. Some young people form small dance bands or rock groups. As they gain experience and become known, they may audition for other local bands, and still later, for the better known bands and orchestras.

Young persons who consider careers in music should have musical talent, creative ability, and poise and stage presence to face large audiences. Since quality of performance requires constant study and practice, self-discipline is vital. Moreover, musicians who do concert and nightclub engagements must have physical stamina because of constant travel and rugged time schedules that often include long night hours.

Employment Outlook

The music performance field is expected to remain keenly competitive through the mid-1980's. Opportunities for concerts and recitals are not numerous enough to provide adequate employment for all the pianists, violinists, and other instrumentalists qualified as concert artists. Competition usually is keen for positions which offer stable employment, such as jobs with major orchestras and teaching positions. Because of the ease with which a musician can enter private music teaching, the number of music teachers has been more than sufficient and probably will continue to be. Although many opportunities are expected for single and short-term emgagements, playing popular music in night clubs, theaters, and other places, the supply of qualified musicians who seek such jobs is likely to exceed demand. On the other hand, first-class, experienced accompanists and outstanding players of stringed instruments are likely to remain relatively scarce.

Employment of musicians who perform is expected to grow about as fast as the average for all occupations through the mid-1980's. Although the number of civic orchestras in smaller communities has been growing steadily, many provide only part-time employment. The decline in opportunities for musicians in theater, radio, and motion pictures has more than offset these openings. The increased use of recorded music has lead to the decline of opportunities in these areas. Additional employment is expected from the expanded use of TV satellites, cable TV, and wider use of video cassettes.

The employment outlook in music education for people who are qualified as teachers as well as musicians is better than for those qualified as performers only. However, the supply of music teachers in the Nation's schools is adequate—a situation which is likely to continue through the mid-1980's.

Earnings and Working Conditions

The amount received for a performance by either classical or popular musicians depends to a large extent on their professional reputation. Musicians in 1 of the 28 major symphony orchestras in the United States in 1974 received minimum salaries that ranged from about $190 to $350 a week according to the American Symphony Orchestras League, Inc. Eight orchestras—New York, Boston, Philadelphia, Cleveland, Cincinnati, Houston Chicago, and the National—have year-round seasons (50 weeks or more) and minimum salaries ranging from $10,000 to $18,000. Other major symphony orchestras have seasons ranging from 34 to 52 weeks.

Musicians who played at dances, club dates, water shows, ballets, musical comedies, concerts, and industrial shows earned a minimum of $33 to $40 for 3 hours of work. The minimum scale for recording is $100 for a 15 minute tape (3 hours actual taping time).

Full-time church musicians earned from $7,500 to $16,000 a year—according to hours worked a week and level of training.

The salary schedule for all teachers determines earnings of music teachers in public schools. (See statements on Elementary and Secondary School Teachers elsewhere in the *Handbook*.) Many teachers give private music lessons to supplement their earnings. However, earnings are uncertain and vary according to the musician's reputation, the number of teachers and students in the locality, and the economic status of the community.

Musicians customarily work at night and on weekends. They also must spend considerable time in practice and in rehearsal.

Many musicians, primarily those employed by symphony orchestras, work under master wage agreements, which guarantee a season's work up to 52 weeks. Musicians in other areas, however, may face relatively long periods of unemployment between jobs. Thus, their earnings generally are lower than those of many other occupations. Moreover, they may not work steadily for one employer. Consequently, some performers cannot qualify for unemployment compensation, and few have either sick leave or vacations with pay.

Most professional musicians belong to the American Federation of Musicians (AFL-CIO). Concert soloists also belong to the American Guild of Musical Artists, Inc. (AFL-CIO).

Sources of Additional Information

For information about wages, hours of work, and working conditions for professional musicians, contact:

American Federation of Musicians (AFL-CIO), 641 Lexington Ave., New York, N.Y. 10022.

Information about the requirements for certification of organists and choir masters is available from:

American Guild of Organists, 630 Fifth Ave., New York, N.Y. 10020.

A list of accredited schools of music is available from:

National Association of Schools of Music, 11250 Roger Bacon Dr., Reston, Va. 22090.

Further information about music teaching in elementary and secondary schools is available from:

Music Educators National Conference, Suite 601, 8150 Leesburg Pike, Vienna, Va. 22180.

SINGERS

(D.O.T. 152.028 and .048)

Nature of the Work

Professional singing is an art that usually requires not only a fine voice but also a highly developed technique and a broad knowledge of music. A small number of singing stars make recordings or go on concert tours in the United States and abroad. Somewhat larger numbers of singers obtain leading or supporting roles in operas and popular music shows, or secure engagements as concert sologists in oratorios and other types of performances. Some singers also become members of opera and musical comedy choruses or other professional choral groups. Popular music singers perform in musical shows of all kinds—in the movies, on the stage, on radio and television, in concerts and in nightclubs and other enterainment places. The best known popular music singers make and sell many recordings.

Since most singers of both classical and popular music have only part-time or irregular employment they often have other jobs and sing only in the evenings or on weekends. Some give private voice lessons. A number of singers teach courses in general music and direct elementary and secondary school choruses. Others give voice training or direct choral groups in churches, in music conservatories or in colleges and universities.

Places of Employment

About 36,000 persons worked as professional singers in 1974. Opportunities for signing engagements are mainly in New York City, Los Angeles, Las Vegas, San Francisco, Dallas and Chicago—the Nation's chief entertainment centers. Nashville, Tennessee, a major center for country and western music, is one

of the most important places for employment of singers for "live" performances and recordings. Singers who teach music in elementary and secondary schools, colleges, universities, and conservation are employed throughout the country. Many work part-time, chiefly as church singers and choir masters.

Training and Other Qualifications

Young persons who want to sing professionally should acquire a broad background in music, including its theory and history. The ability to dance may be helpful, since singers are sometimes required to dance. In addition, those interested in a singing career should start piano lessons at an early age to become familiar with the musical scale and music composition. As a rule, voice training should not begin until after the individual has matured physically, although young boys who sing in church choirs receive some training before their voices change. Moreover, because voice training often continues for years after the singer's professional career has started, a prospective singer must have great determination. An audition before a competent voice teacher to decide whether professional training is warranted is also important.

To prepare for careers as singers of classical music young people can enroll in a music conservatory, a school or department of music connected with a college or university, or take private voice lessons. These schools provide voice training, and training in understanding and interpreting music, including music-related training in foreign languages and sometimes dramatic training. After completing 4-years of study, the graduate may receive either the degree of bachelor of music, bachelor of science or arts (in music), or bachelor of fine arts.

Young singers who plan to teach in public schools need at least a bachelor's degree with a major in music education and must meet the State certification requirements for teachers. Over 700 colleges and universities offer such training. Most college teachers must have a master's degree or doctor's degree, but exceptions may be made for well-qualified artists.

Although voice training is an asset for singers of popular music, many with untrained voices have had successful careers. The typical popular song does not demand that the voice be developed to cover as wide a range on the musical scale as does classical music, and the lack of voice projection may be overcome by use of a microphone.

Young singers of popular songs may become known by participating in local amateur and paid shows. These engagements may lead to employment with local dance bands or rock groups and possibly later with better known ones.

In addition to musical ability, perseverance and an outstanding personality, a singing career requires an attractive appearance, good contacts, and good luck. Singers also must have physical stamina to adapt to rigorous time and travel schedules which often include working night hours.

Employment Outlook

The employment outlook for singers is expected to remain keenly competitive through the mid-1980's despite an expected faster than the average rate of employment growth. Many short-term jobs are expected in the opera and concert stage, movies, theater, nightclubs, radio and television, dance bands, and other areas—but not enough to provide steady employment for all qualified singers. Singers who can meet State certification requirements may find positions as music teacher.

Recorded music has replaced the "live" singer on radio; television performances by singers are limited. However, the demand is growing for singers who record popular music to do radio and television commercials. Additional employment is expected from the expanded use of TV satellites, cable TV, and wider use of video cassettes.

A singing career is sometimes relatively short, since it depends on a good voice and public acceptance of the artists, both of which may be affected by age. Due to these circumstances and factors discussed elsewhere in the text, singers may be subject to unstable employment conditions and the pressure of unreliable financial circumstances.

Earnings and Working Conditions

Except for a few well-known concert soloists, opera stars, top recording artists of popular music, and some dance band singers. Most professional singers experience difficulty in obtaining regular employment and have to supplement their incomes.

Singers generally work at night and on weekends. Work in the entertainment field is seasonal and few performers have steady jobs.

Singers who appeared in theatrical and TV motion picture productions received a minimum of $187.50 a day or $604 a week in 1974. Singers in opera choruses received $40 per performance. A few opera soloists and popular singers earned thousands of dollars a performance.

Professional singers usually belong to a branch of the AFL-CIO union, the Associated Actors and Artists of America. Singers on the concert stage or in opera belong to the American Guild of Musical Artists, Inc.; those who sing on radio or live television or make phonograph recordings are members of the American Federation of Television and Radio Artists; singers in the variety and nightclub field belong to the American Guild of Variety Artists; those who sing in musical comedy and operettas belong to the Actors' Equity Association; and those who sing in the movies belong to the Screen Actors Guild, Inc.

Sources of Additional Information

Information about accredited schools and departments of music is available from:

National Association of Schools of Music, 11250 Roger Bacon Dr., Reston, Va. 22090.

For information about music teaching in elementary and secondary schools contact:

Music Educators National Conference, Suite 601, 8150 Leesburg Pike, Vienna, Va. 22180.

DESIGN OCCUPATIONS

Good design can improve the appearance and usefulness of the products that we use and the places where we live and work, as well as increase sales by improving their "eye appeal." Making products or places more appealing and functional and bringing them to the attention of the public is the job of people in design occupations.

Different design careers require varying levels of training and education. For example, while floral designers often learn their duties on the job and do not need a high school diploma, architects must have at least 5 years of college and professional education. Regardless of the amount of formal training required, people in design occupations should be creative and be able to communicate ideas through their designs and displays.

Job opportunities in design occupations are expected to increase through the mid-1980's, primarily because a growing and more affluent population is becoming more design conscious.

This chapter describes 10 design occupations: architects, commercial artists, display workers, floral designers, industrial designers, interior designers, landscape architects, models, photographers, and urban planners. (Other jobs that often require design skills—for example, engineers—are described elsewhere in the *Handbook*.)

ARCHITECTS

(D.O.T. 001.081)

Nature of the Work

Attractive buildings improve the physical environment of a community. But buildings also must be safe and allow people both inside and around them to properly perform their duties. Architects design buildings that successfully combine these elements of attractiveness, safety, and usefulness.

Most architects provide professional services to clients planning a building project. These services begin in the early stages of the project's development and continue until all work is completed.

The architect and client first discuss the purposes, requirements, and cost of a project, as well as any preference on design that the client may have. The architect then prepares a rough drawing to show the scale and structural relationships of the building.

After discussing preliminary drawings with the client, the architect develops a final design showing the floor plans and the structural details of the project. For example, in designing a school, the architect determines the width of corridors and stairways so that students may move easily from one class to another; the type and arrangement of storage space, and the location and size of classrooms, laboratories, lunchroom or cafeteria, gymnasium, and administrative offices.

Next the architect prepares working drawings showing the exact dimensions of every part of the structure and the location of plumbing, heating units, electrical outlets, and air conditioning.

Architects also specify the project's building materials, construction equipment, and in some cases, interior furnishings. In all cases, the architect must insure that the structures' design and specifications conform to local and State building codes, zoning laws, fire regulations, and other ordinances.

After all drawings are completed, the architect assists the client in selecting a contractor and in negotiating the contract. As construction proceeds, there are periodic visits to the building site to insure that the contractor is following the design and using the specified materials. The job is not completed until construction is finished, all required tests are made, and guarantees are received from the contractor.

Architects design a wide variety of structures such as houses, churches, hospitals, office buildings, and airports. They also design multibuilding complexes for urban renewal projects, college campuses, industrial parks, and new towns. Besides designing structures, architects also may help in selecting building sites, in preparing cost and land use studies, and in long range planning for site development.

When working on large projects or for large architectural firms, architects often specialize in one phase of the work such as designing, or administering construction contracts. This often requires working with engineers, urban planners, landscape architects, and other design personnel.

Places of Employment

About 40,000 registered (licensed) architects were employed in 1974. Many unlicensed architectural school graduates also work as architects.

About two-fifths of all architects are self-employed, either practicing individually or as partners. Most of the others work in architectural firms, for builders, for real estate firms, or for other businesses that have large construction programs. Some work for government agencies, often in city and community planning or urban redevelopment.

Architects design floor plans for new building.

About 1,300 architects work for the Federal Government, mainly for the Departments of Defense, Housing and Urban Development, and the General Services Administration.

Although found in many areas, a large proportion of architects were employed in seven cities: Boston, Chicago, Los Angeles, New York, Philadelphia, San Francisco, and Washington.

Training, Other Qualifications, and Advancement

All States and the District of Columbia require architects to be licensed. To qualify for the 2-day licensing exam, a person must have either a bachelor of architecture degree followed by 3 years of experience in an architect's office or a master of architecture degree followed by 2 years of experience. As a substitute for formal training, most States accept additional experience (usually 12 years) and successful completion of an equivalency test for admission to the licensing examination. Many architectural school graduates work in the field even though they are not licensed. However, a registered architect is required to take legal responsibility for all work.

In 1974, the National Architectural Accrediting Board had accredited 76 of the 100 schools offering professional degrees in architecture. Most of these schools offer a 5-year curriculum leading to a Bachelor of Architecture degree or a 6-year curriculum leading to a Master of Architecture degree. Students may also transfer to professional degree programs after completing a 2-year junior or community college program in architecture. Many architectural schools also offer graduate education for those who already have their first professional degree. Although such training is not essential for practicing architects, it is often desirable for those in research and teaching. A typical college architectural program includes courses in architectural theory, design, graphics, engineering, and urban planning, as well as courses in English, mathematics, chemistry, sociology, economics, and a foreign language.

Persons planning careers in architecture should be able to work independently, have a capacity for solving technical problems, and be artistically inclined. They also must be prepared to work in the competitive environment of business where leadership and ability to work with others are important. Working for architects or building contractors during summer vacations is useful for gaining practical knowledge.

New graduates usually begin as junior drafters in architectural firms, where they make drawings and models of structures under the direction of a registered architect. After several years of experience, they may advance to chief or senior drafters responsible for all major details of a set of working drawings and for supervising other drafters. Others may work as designers, construction contract administrators, or specification writers who prepare directions explaining the architect's plan to the builder. Employees who become associates in their firms receive, in addition to a salary, a share of the profits. Usually, however, the architect's goal is to establish a private practice.

Employment Outlook

Job prospects for architects are expected to be favorable through the mid-1980's. Employment of

architects is expected to rise at a much faster rate than the average for all workers during this period. In recent years, the number of degrees granted in architecture also has been increasing rapidly. If this trend continues, the number of people seeking employment in the field should be roughly in balance with the number of openings from growth, deaths, and retirements. The outlook for these workers may change, however, during shortrun periods. Since the demand for architects is highly dependent upon the level of new construction, any significant upsurge or downturn in building could temporarily alter demand.

Most job openings are expected to be in architectural firms but some openings are also expected to occur in colleges and universities, construction firms and the Government as agencies become more involved in environmental design and planning. (See statement on Urban Planners elsewhere in the *Handbook*.)

The major factor contributing to the increase in employment of architects is the expected rapid growth of nonresidential construction. In addition, the projected increase in enrollments in architectural programs should result in additional requirements for architects to teach in colleges and universities.

Growing public concern about the quality of the physical environment is expected to increase the demand for urban redevelopment and city and community environmental planning projects. This should create further opportunities for employment.

Earnings and Working Conditions

The average salary for architects in 1973 was $23,000 according to the limited information available. Architects with well-established private practices generally earn much more than high-paid salaried employees of architectural firms. Although the range in their incomes is very wide, some architects with many years of experience and good reputations earned well over $35,000 a year. Architects starting their own practices may go through a period when their expenses are greater than their incomes. Annual incomes may fluctuate due to changing business conditions.

Depending on their college records, architects having a bachelor's degree and no experience could start in the Federal Government at either $163 or $202 a week in 1974. Architects who have completed all requirements for the master's degree can start at $247 and those with a Ph. D. at $334 a week.

Most architects spend long hours at the drawing board in well equipped offices. An architect sometimes has to work overtime to meet a deadline. The routine often is varied by interviewing clients or contractors, and discussing the designs, construction procedures, or building materials of a project with other architects or engineers. Contract administrators frequently work outdoors during inspections at construction sites.

Sources of Additional Information

General information about careers in architecture including a catalog of publications can be obtained from:

The American Institute of Architecture, 1735 New York Ave., Washington, D.C. 20036.

Information about schools of architecture and a list of junior colleges offering courses in architecture are available from:

The Association of Collegiate Schools of Architecture, Inc., 1735 New York Ave., Washington, D. C. 20036.

COMMERCIAL ARTISTS

(D.O.T. 141.031 and .081, 970.281 and .381, and 979.381)

Nature of the Work

A team of commercial artists with varying skills and specializations often creates the artwork in newspapers and magazines and on billboards, brochures, catalogs, and television commercials. This team is supervised by an art director, who develops the artistic aspects of an advertising plan, and then turns it over to a layout artist for further refinement. The layout artist who constructs or arranges elements of the advertisement, also selects and lays out illustrations and photographs, plans use of typography, and determines color and other elements of design. Preparation of a "rough visual" or sketch is the next step. The layout artist may change the visual after consulting with the director and complete a more comprehensive layout for the customer.

A variety of specialists work with the layout artist to turn out the finished product. These include *renderers*, who use magic markers to make rough drafts; *letterers*, who execute appropriate lettering either freehand or with mechanical aids; *illustrators*, who sketch and draw in more finished form; and *pasteup* and *mechanical workers*, who cut and paste basic parts of the advertisement or other artwork by using a ruling pen and other drafting tools. Some workers, called *general board workers*, spend nearly all their time at the drawing board performing many of these specializations. Apprentices help general board workers or other specialists by doing routine jobs such as separating colors and cutting mats.

In a small office, the art director may perform the layout and board work with the aid of apprentices. In a large office, the art director develops concepts with the copywriter; sets standards; deals with clients; and purchases needed

photographs, illustrations, lettering, and other artwork from freelancers.

Advertising artists create the concept and artwork for a wide variety of items. These include direct mail advertising, catalogs, counter displays, slides, and filmstrips. They also design or lay out the editorial pages and features and produce or purchase the necessary illustrations or artwork. Some commercial artists specialize in producing fashion illustrations, greeting cards, or book illustrations, or in making technical drawings for industry.

Places of Employment

About 64,000 persons, one-third of them women, worked as commercial artists in 1974. Although some commercial artists can be found in nearly every city, the majority work in large cities, such as New York, Los Angeles, Boston, Washington, D.C., and Chicago, where the largest users of commercial art are located.

Most commercial artists work as staff artists for advertising departments of large companies, printing and publishing firms, textile companies, photographic studios, television and motion picture studios, department stores, and a variety of other business organizations. Many are self-employed or freelance artists. Some salaried commercial artists also do freelance work in their spare time. About 2,400 commercial artists work for Federal Government agencies, principally in the Defense Department. A few teach in art schools.

Training, Other Qualifications, and Advancement

Artistic ability, judgment, imagination and a capacity to visualize ideas on paper are important qualifications for success in commercial art. However, these qualities must be developed by specialized training in the techniques of commercial and applied art. Education in the fine arts—painting, sculpture, or architecture—and in academic studies generally provides a good foundation for obtaining employment in commercial art, and may be essential for promotion. Special courses in visualization, typography and production, and TV commercial creation and production also are desirable.

The most widely accepted training for commercial art is the instruction given in art schools or institutes that specialize in commercial and applied art. To enter art school, an applicant must usually have a high school education. Some schools admit only applicants who submit acceptable work samples. The course of study, which may include some academic work, generally takes 2 or 3 years, and a certificate is awarded on graduation. A growing number of art schools, particularly those in or connected with universities, require 4 years or more of study and confer a bachelor's degree—commonly the bachelor of fine arts (B.F.A.). About 300 colleges and universities confer such degrees. In these schools, commercial art instruction is supplemented by liberal art courses, such as English and history. Limited training in commercial art also may be obtained through public vocational high schools and practical experience on the job. However, supplemental training usually is needed for advancement. Beginners also should supplement their formal education and training by experience in doing posters, layouts, illustrations and similar projects for schools and other organizations.

The first year in art school may be devoted primarily to the study of

fundamentals—perspective, design, color harmony, composition—and to the use of pencil, crayon, pen and ink, and other art media. Subsequent study, generally more specialized, includes drawing from life, advertising design, graphic design, lettering, typography, illustrations, and other courses in the student's particular field of interest.

The various specialties, however, differ in some of the specific abilities required. For example, letterers and retouchers must do precise and detailed work that requires excellent coordination, whereas illustrators and designers need imagination, a distinctive art style, and, in most cases, the ability to draw well. Some experience with photography, typography, and printing production is useful in art direction or design. Freelance commercial artists must sell both ideas and finished work to clients. A knowledge of type specifications and printing production methods is very helpful. A business sense and responsibility in meeting deadlines are assets, also. Art directors need a strong educational background in art and business practices and the liberal arts. Advertising art directors require a special kind of creativity—the ability to conceive ideas that will stimulate the sale of the client's products or services.

Beginning commercial artists usually need some on-the-job training to qualify for other than strictly routine work. Advancement is based largely on the individual's artistic talent, creative ability, and education. After considerable experience, many salaried commercial artists leave to do freelance work. Most illustrators are freelancers; many of them have an agent.

Commercial artists usually assemble their best artwork into a "portfolio," to display their work. A good portfolio is essential in obtaining initial employment and freelance assignments as well as for job changes.

Employment Outlook

Talented and well-trained commercial artists may face competition for employment and advancement in most kinds of work through the mid-1980's. Those with only average ability and little specialized training probably will encounter keen competition for beginning jobs and have limited opportunities for advancement.

Employment of commercial artists is expected to increase about as fast as the average for all occupations through the mid-1980's. One anticipated area of growth is in visual advertising such as television graphics, packaging displays, and poster and window displays. The expanding field of industrial design also is expected to require more qualified artists to do three-dimensional work with engineering concepts. (See statement on Industrial Designers.) In addition, several thousand jobs for commercial artists are expected to open each year throughout the period to replace workers who will die, retire, or leave the field for other reasons.

The demand for commercial artists is expected to vary by specialization or type. For example, demand for freelance artists is expected to increase; experienced paste-up and mechanical artists are always needed; jobs for designers, art directors, and layout men will be fewer, much sought after and open only to experienced, high talented, and creative artists.

Commercial art occupations are particularly sensitive to changes in business conditions. Therefore, jobseekers may find opportunities in any one year more or less plentiful in accordance to economic conditions.

Earnings and Working Conditions

In 1974, beginning commercial artists having no training beyond vocational high school typically earned from $85 to $90 a week; graduates of 2-year professional schools, $90 to $100 a week; and graduates of 4-year post-high school programs, $100 to $120 a week, according to the limited data available. Talented artists who had strong educational backgrounds and good portfolios, however, started at higher salaries. After a few years of experience, qualified artists may expect to earn $140 to $160 a week or more. Art directors, designers, executives, well-known freelance illustrators, and others in top positions generally have much higher earnings, from $300 to $500 a week or more.

Earnings of freelance artists vary widely, since they are affected by factors such as skill level, variety, and popularity of work. Freelancers receive from $25 for a single black-and-white fashion sketch to $2,000 for a color cover for a national magazine. Freelance artists may be paid by the hour or by the assignment. Commercial artists who worked for the Federal Government in 1974 had an average annual salary of $13,196 or $256 a week.

Salaried commercial artists generally work 35 to 40 hours a week, but sometimes they must work additional hours and under a considerable amount of pressure in order to meet deadlines. Freelance artists usually have irregular working hours.

Sources of Additional Information

Information on institutions offering programs in commercial art is available from:

National Art Education Association, National Education Association, 1916 Association Dr., Reston, Va. 22091.

DISPLAY WORKERS (RETAIL TRADE)

(D.O.T. 298.081)

Nature of the Work

It happens every shopping day: A person browsing through a clothing store notices a mannequin wearing an attractive suit and, without having planned to, purchases a similar outfit. A fishing enthusiast sees a display of angling equipment in a store window, goes in, and buys a new reel.

Incidents like these show how displays in stores and store windows can attract customers and encourage them to buy. Knowing the effectiveness of this form of advertising, some stores allot a large share of their publicity budget to displays.

Display workers specialize in designing and installing such exhibits. Their aim is to develop attractive, eye-catching ways of showing store merchandise to best advantage. To create a setting that enhances the merchandise, display workers need imagination as well as knowledge of color harmony, composition, and other fundamentals of art. They may, for example, choose a theme—a beach setting to advertise bathing suits or surfing equipment—and design a colorful display around this theme. After the design has been approved by the store's management, display workers obtain the props and other necessary accessories. This is where their craft skills come into play.

Display workers often construct many of the props themselves using hammers, saws, spray guns, and other tools. They may be assisted in these tasks by a helper or by store maintenance workers. Display workers also may use props out of storage, designed for previous displays, or order props from firms which specialize in them. The display workers install the props, background settings, and lighting equipment. They also dress mannequins and add finishing touches. Periodically, they dismantle old displays and replace them with new ones.

In large stores that employ several display workers, each may specialize in a particular activity such as carpentry, painting, making signs, or setting up displays. Overall planning and administration in large stores is usually the responsibility of a display director who supervises and coordinates the activities of the department. The director confers with architects and executives, such as advertising and sales managers, to select merchandise to be promoted and to design displays.

Places of Employment

About 34,000 persons worked as display workers in retail stores in 1974. Most worked in department, clothing, and homefurnishing stores; others in variety, drug, and shoe stores and in book and gift shops. Several thousand additional freelance or self-employed display workers serviced small stores that needed professional window dressing but could not afford full-time display workers. Freelancers are among the most highly skilled workers in this field.

While major department stores may have as many as 30 or 40 display workers, most stores have only one or two.

Geographically, employment is distributed much like the Nation's population, with most jobs in larger towns and cities.

Training, Other Qualifications, and Advancement

Most display workers learn their trade through informal on-the-job training. Beginners are hired as helpers to dismantle displays, carry props, and do other routine tasks. Gradually, they are given the opportunity to do more difficult work such as building props and, if they show artistic talent, planning simple designs. A beginner usually can become skilled in 2 to 3 years. Training time varies, however, depending on the beginner's ability and the variety and complexity of displays that the employer requires.

When hiring inexperienced workers, most employers will consider only applicants who have finished high school. Courses that provide helpful training for display work include art, woodworking, mechanical drawing, and merchandising. Some employers seek applicants who have completed college courses in art, interior decorating, fashion design, advertising, or related subjects. College training improves opportunities for advancement to managerial jobs.

Creative ability, manual dexterity, and mechanical aptitude are among the most important personal qualifications needed in this field. Good physical condition and agility are needed to carry equipment, climb ladders, and work in close quarters without upsetting props.

Advancement may take several forms. A display worker with supervisory ability might become display director in a large store. A display director might in turn progress to sales promotion director or be placed in charge of store planning.

Freelance work is another avenue of advancement. Some workers moonlight until they have enough clients for full-time work on

their own. Relatively little money is needed to start a freelance business, but since this is a highly competitive field, self-employment is likely to be a struggle, particularly at the outset.

The display worker's skills could lead to jobs in other art-related occupations such as interior decoration or photography. These occupations, however, require additional training.

Employment Outlook

Employment of display workers is expected to grow about as fast as the average for all occupations through the mid-1980's. The chief spur to employment gains will be the construction of additional stores as population grows. Also, many stores are placing greater emphasis on window and interior displays as a means to stimulate sales. In addition to the jobs resulting from employment growth, many openings will arise each year to replace experienced workers who retire, die, or transfer to other occupations.

Employment opportunities will be concentrated in large stores, most of which are located in metropolitan areas. Although many jobs will be available for applicants who have no more than a high school education, opportunities will be best for those who have completed college courses in art, interior decorating, fashion design, advertising, or related subjects.

Earnings and Working Conditions

Among large employers, weekly salaries for beginners ranged from $80 to $125 in 1974. Beginners who have completed college courses in art, interior decorating, or related subjects generally receive the higher starting salaries. Experienced display workers' salaries range from $120 to $225 a week, depending largely on experience and ability. Most display directors earn between $10,000 and $15,000 a year. Experienced directors in large metropolitan department stores may earn considerably more, particularly those who occupy executive positions.

The earnings of freelancers depend on their talent and prestige, on the number and kinds of stores they service, and on the amount of time they devote to the work. Many freelancers earn more than $15,000 a year, and some earn more than $30,000.

Display personnel enjoy the satisfaction of doing creative work. Developing an original design and transforming it into reality can be a highly rewarding experience.

Display workers usually work 35 to 40 hours a week. During busy seasons, such as Christmas and Easter, they may work overtime, nights, and weekends to prepare special displays.

Constructing and installing props frequently require prolonged standing, bending, stooping, and working in awkward positions. Display workers risk injury from falls off ladders, from contact with sharp or rough materials, and from the use of power tools, but serious injuries are uncommon.

Sources of Additional Information

Details on career opportunities can be obtained from local retailers, such as department stores, and from local offices of the State employment service.

FLORAL DESIGNERS

(D.O.T. 142.081)

Nature of the Work

Floral designers assemble selected flowers and foliages for a specific design to express the thoughts and sentiments of the sender. Knowledge of flower forms (shapes), plant materials, and floral design enables designers to create floral and plant gifts, decorations, and tributes.

In any given day, designers may receive a variety of orders including decorative potted plants, bouquets, corsages, funeral work, and dried flower arrangements. Special orders, such as weddings and parties, also incorporate the creative design and decorating talents of the floral designer.

Designers work from a written order indicating customer preference for color and type of flower, as well as the cost, date, time, and place the arrangement or plant is to be delivered. Customers may leave the choice of flowers, color, and design to the discretion of the designer.

Designers must know the names and keeping (lasting) qualities of flowers as well as growing information of potted plants. They also know the seasonal availability of flower and plant material. Flowers are obtained from local wholesalers or shipped directly from growers.

A funeral order may read "easel spray of red and white flowers." For the foundation, the designer attaches a base (styrofoam, needle pack, etc.) near the top of a three-legged wire stand. Appropriate flowers are selected from the floral refrigerator. White gladiolas and red carnations are a possible combination. The price of the order and the cost of the flowers determine the number of flowers used. The flowers are cut to the needed length and wired for security. Stems are strengthened with wood sticks for easy insertion into the base.

To background the flowers, designers insert leafy branches such as chamadorea or fern into the base. Gladiolas are evenly spaced so that the tips of the flowers approximate a spear or diamond shape. Carnations are placed between the gladioli to provide contrasting forms, color harmony, and depth. A bow placed at the focal

Floral arrangements express the designer's artistic and creative talent.

point of the spray may vary according to converging lines. Foliage is added to hide construction. On the back of the handwritten sympathy card are the description of the spray and the donor's name and address for easy acknowledgement. The spray is ready for delivery. This type order is usually completed in 15 minutes.

Floral designers have other duties. They help customers select flowers, plants, gifts and floral accessories available in the shop. During slack periods, designers decorate potted plants, arrange planters, and terrariums and prepare accessories for a coming season—for example, bows and streamers for football corsages or dressings for potted plants.

Places of Employment

About 33,000 floral designers were employed in 1974. Nearly all designers work in the retail flower shops common to large cities, suburban shopping centers, and small towns. Most shops are small and employ only one or two floral designers; Many designers manage their own stores. Geographically, employment is distributed much the same as population.

Training, Other Qualifications, and Advancement

Many floral designers are trained on the job. Beginners usually prepare flowers for storage, deliver orders, and do general cleanup work. Shop managers look for bright, eager helpers, who dress neatly, have pleasant personalities, and can deal effectively with customers. After a few weeks, helpers learn enough about flowers, potted plants, and gift items to assist customers in making selections.

Young people who want to become designers usually are trained on the job by the manager or an experienced floral designer. Initially they copy simple arrangements that use one type of flower. If they work quickly with their hands and recognize the shape, color and position of flowers which make attractive arrangements, instruction in more complex arrangements is given. As experience is gained, original designs required for special orders can be attempted. Usually a person can become a fully qualified floral designer after 2 years of on-the-job training.

Good color vision, manual dexterity, and the ability to arrange various shapes and colors in attractive patterns are the primary qualifications for this occupation. A high school diploma generally is not required, but applicants must be abe to write legibly and do simple arithmetic in order to write up bills for customers. High school courses in business arithmetic, selling techniques, and other business subjects are helpful. While still in school, a student may work part time in a flower shop, especially before holiday seasons such as Christmas and Easter.

An increasing number of floral designers take courses in floral arrangement in public and private schools and junior colleges. However, whether they last from 6 weeks to 2 years, courses are not a substitute for on-the-job training and experience. Longer courses provide training in flower marketing and shop management for floral designers who plan to operate their own shops.

Floral designers have limited advancement possibilities. Those with

supervisory ability may advance to manager in large flower shops. Managers who have the necessary capital may open their own shops.

Employment Outlook

The outlook for employment as a floral designer is expected to be good through the mid-1980's. Employment is expected to increase faster than the average for all occupations. In addition to job openings created by employment growth, many openings will arise each year as workers retire, die, or change occupations. However, designer employment depends on the income of customers, and the number of job openings may vary with ups and downs in the economy.

Studies of sales in retail florist stores indicate that customers with higher incomes spend a greater proportion of their income to buy flowers. Since the income of each person, as well as the number of people is expected to increase, flower sales should increase significantly. As a result, more floral designers will be needed to prepare arrangements.

Earnings and Working Conditions

Limited information indicates that in 1974 qualified designers earned between $2.50 and $6 an hour. Rates for trainees ranged from $1.60 to $2 an hour, but seldom exceeded the legal minimum wage. Because most flower shops are small, designers may be exempt from minimum wage laws. Besides earning money, designers achieve the satisfaction of doing creative work and seeing their ideas transformed into reality.

In small shops, floral designers usually work 8 hours a day, Monday through Saturday. In many large shops, designers who work Saturday get a day off during the week.

Most designers receive holiday and vacation pay. Because most shops are small, other fringe benefits are limited. Some employers pay part of the cost of group life and health insurance but few contribute to retirement plans other than social security. Floral designers in a few cities are members of the Retail Clerks International Association.

Floral designers must be able to stand for long periods. Work areas are kept cool and humid to preserve the flowers and designers are exposed to sudden temperature changes when entering or leaving storage refrigerators. Aside from the possibility of small cuts from knives or scratches from flower thorns, this occupation has few hazards.

Sources of Additional Information

For additional information about careers in floral design and addresses of schools offering courses in this field, write to:

Society of American Florists and Ornamental Horticulturists, 901 N. Washington St., Alexandria, Va. 22314.

INDUSTRIAL DESIGNERS

(D.O.T. 142.081)

Nature of the Work

When people buy a product, whether it's a home appliance, a new car, or a ball point pen, they want it to be attractive as well as useful. Industrial designers combine artistic talent with knowledge of marketing, materials, machines, and methods of production to improve the appearance and functional design of products so that they compete favorably with similar goods on the market.

As the first step in their work, industrial designers study the product and competing products to determine possible uses. Then they sketch different designs and consult with engineers, production supervisors, and sales and market research personnel about the practicability and sales appeal of each idea.

After company officials select the most suitable design, the industrial designer or a professional modeler make a model, often of clay so that it can be easily changed. After any necessary revisions a final or working model is made, usually of the material to be used in the finished product. The approved model is then put into production.

Some industrial designers seek to create favorable public images for companies and for government services such as transportation by developing trademarks or symbols that appear on the firm's product, advertising, brochures, and stationery. Some design containers and packages which both protect and promote their contents. Others prepare small display exhibits or the entire layout for industrial fairs. Some design the interior layout of special purpose commercial buildings such as restaurants and supermarkets.

Industrial designers employed by a manufacturing company usually work only on the products made by their employer. This may involve filling day-to-day design needs of the company or long-range planning of new products. Consultants for more than one industrial firm may plan and design a great variety of products.

Places of Employment

About 10,000 persons—about 10 percent women—were employed as industrial designers in 1974. Most worked for large manufacturing companies designing either consumer or industrial products or for design consulting firms. Others did freelance work, or were on the staffs of architectural and interior design firms.

Industrial design consultants work mainly in large cities, for ex-

ample, New York, Chicago, Los Angeles, and San Francisco. Those with industrial firms usually work in or near the manufacturing plants of their companies, which often are located in small and medium size cities.

Training, Other Qualifications, and Advancement

Completing a course of study in industrial design in an art school, in the design or art department of a university, or in a technical college is the usual requirement for entering this field of work. Persons majoring in engineering, architecture, and fine arts may qualify as industrial designers if they have appropriate experience and artistic talent. Most large manufacturing firms hire only industrial designers who have a bachelor's degree in the field.

In 1974, 41 colleges and art schools offered programs or courses in industrial design. The Industrial Designers Society of America recognizes 25 of these programs as effective in preparing students for employment as industrial designers.

Industrial design programs usually take 4 years, although a few colleges and universities require 5 years. These schools award a bachelor's degree in industrial design or fine arts; some also award a master's degree. Admittance to most of these schools requires a high school diploma. In some cases, students must present sketches and other examples of their artistic ability.

Industrial design programs differ considerably among schools. Most college and university programs stress the engineering and technical aspects of the field; art schools generally stress a strong background in art. In most programs, students spend much time in the lab designing objects in three dimensions. In studio courses, students make drawings and models with clay, wood, plaster, and other easily worked materials. In schools that have the necessary machinery, students make models of their designs while learning to use metalworking and woodworking machinery. Students also take basic and abstract art and sculpture courses. Some schools require courses in basic engineering and in composition of materials. Courses in business administration and marketing can be helpful in getting a job.

Industrial designers must have creative talent, drawing skills, and the ability to see familiar objects in new ways. They must understand and meet the needs and tastes of the public, rather than design only to suit their own artistic sensitivity. Designers should not be discouraged when their ideas are rejected—often designs must be resubmitted many times before one is accepted. Since industrial designers must cooperate with engineers and other staff members, the ability to work and communicate with others is important. Design consultants should also understand business practices and have sales ability.

Applicants for jobs should assemble a "portfolio" of drawings and sketches to demonstrate their creativity and ability to communicate ideas.

New graduates of industrial design programs frequently assist experienced designers and do simple assignments. As they gain experience, they may become supervisors with major responsibility for the design of a product or a group of products. Those who have an established reputation and the necessary funds may start their own consulting firms.

Industrial designers confer on plans for new product design.

Employment Outlook

Employment in this relatively small occupation is expected to grow about as fast as the average for all occupations. A growing population and rising incomes will create markets for newly designed products, for improved designs of existing products and packaging and, in turn, for industrial designers who create them. Some employment opportunities also will arise each year as designers die, retire or leave the field.

Employment opportunities are expected to be best for college graduates with degrees in industrial design. Opportunities will also arise for engineering, and architectural school graduates.

Demand for industrial designers may fluctuate over short-run periods. During times of economic downturns when consumer and industrial demand for new products is dampened, requirements for these workers may decline.

Frequent redesign of household products, automobiles, and industrial equipment has always created a need for designers. Although recently the trend has been away from annual style changes, further emphasis on safer products should increase demand for industrial designers since a safer product is usually a better designed product.

Small companies probably will make increasing use of services offered by industrial design consulting firms to compete more effectively with larger firms. However, some of these services, such as trademark and package design, could be offered by advertising agencies.

Earnings and Working Conditions

Salaries for inexperienced industrial designers with a bachelor's degree generally ranged from $9,000 to $12,000 a year in 1974, according to limited data. After several years experience, it is possible to earn $14,000 to $18,000 a year. Salaries of those with many years of experience averaged more than $20,000 a year, but varied according to individual talent and the size and type of firm.

Though earnings of industrial designers who own their consulting firms fluctuate markedly, in recent years most consultants earned between $24,000 and $32,000; heads of large well-known firms earned considerably more.

Sources of Additional Information

A brochure about careers and a list of schools offering courses and degrees in industrial design are available for 50 cents from:

Industrial Designers Society of America, 1750 Old Meadow Rd., McLean, Va. 22101

INTERIOR DESIGNERS

(D.O.T. 142.051)

Nature of the Work

The creative work of interior designers, sometimes called *interior decorators*, helps make our living, working, and playing areas more attractive and useful. Interior designers plan and supervise the design and arrangement of building interiors and furnishings. They help clients select and estimate the cost of furniture, draperies, other fabrics, floor coverings, and accessories. Interior designers may do "boardwork," particularly on large assignments. Boardwork includes work on floor plans and elevations and preparing sketches or other perspective drawings so clients can visualize their plans. After the client approves both the plans and the cost, the designer may make arrangements for buying the furnishings; for supervising the work of painters, floor finishers, cabinetmakers, carpet layers, and other craft workers; and for installing and arranging the furnishings.

Many large department and furniture stores have separate design departments to advise their customers on decorating and design plans. The designer's principal function in these departments is to help sell the store's merchandise, although materials from outside sources may be used occasionally when they are essential to the customer's plans. Department store designers frequently advise the store's buyers and executives about style and color trends in interior furnishings.

Interior designers may work on private homes or commercial buildings. Those who specialize in commercial structures often work for clients on large design projects such as the interiors of entire office buildings, hospitals, and libraries. Generally they plan the complete layout of rooms without changes to the structure of the building. Sometimes they redesign or renovate the interiors of old buildings. In these cases, an architect must check the plans to assure compliance with building requirements and to solve structural problems. Some interior designers also design the furniture and accessories to be used in various structures, and then arrange for their manufacture. A few have unusual jobs such as designing interiors of ships and aircraft, while others design stage sets used for motion pictures or television.

Places of Employment

About 34,000 persons—half of them men—worked as interior designers in 1974. Most workers in this occupation are employed in large cities.

Some interior designers own their own establishment, either alone or as members of a firm with other designers. Large design firms employ designers who work independently or as assistants to more senior designers.

Other interior designers work in large department or furniture stores, and a few have permanent jobs with hotel and restaurant chains. Some work for architects, furniture suppliers, antique dealers, furniture and textile manufacturers, or other manufacturers in the interior furnishing field.

Interior designers work for magazines that feature articles on home furnishings. Some large industrial corporations employ interior designers on a permanent basis.

Training, Other Qualifications, and Advancement

Formal training in interior design is becoming increasingly important for entrance into this field. Most department stores, well-established design firms, and other major employers will accept only professionally trained people for beginning jobs. The types of training available include 3-year programs in a professional school of interior design, 4-year college or university programs which issue a bachelor's degree, or post-graduate programs leading to a master's degree or the Ph. D. The basic course of study usually includes the principles of design, history of art, freehand and mechanical drawing, painting, study of the essentials of architecture as they relate to interiors, design of furniture and exhibitions, and study of various materials, such as woods, plastics, metals, and fabrics. A knowledge of furnishings, art pieces, and antiques is important. In addition, courses in sales, business procedures, and other business subjects are valuable.

Membership in the American Society of Interior Design is a recognized mark of achievement in this profession. Membership usually requires the completion of 3 or 4 years of post-high school education in design, and several years of practical experience in the field, including supervisory work.

Interior designers and clients discuss furniture selection.

Persons starting in interior design usually serve a training period, either with design firms, in department stores, or in furniture stores. They may act as receptionists, as shoppers with the task of matching materials or finding accessories, or as stockroom assistants, salespersons, assistant decorators, or junior designers. In most instances, from 1 to 5 years of on-the-job training is required before a trainee becomes eligible for advancement to designer. Beginners who do not get trainee jobs often work selling fabric, lamps, or other interior furnishings to gain experience in dealing with customers and to become familiar with the merchandise. This experience may help in obtaining a job in design or may lead to a career in merchandising.

After considerable experience, designers may advance to design department head, interior furnishings coordinator, or to other supervisory positions in department stores or in large design firms. If they have the necessary funds, they may open their own businesses. Exceptionally talented people can advance rapidly.

Artistic talent—color sense, good taste, imagination—good business judgment, and ability to work with detail and to deal with people are important assets for success in this field. An advantage to interior design as a career is the satisfaction of seeing the results of one's work.

Employment Outlook

Persons seeking beginning jobs in interior designing are expected to face competition through the mid-1980's. Interior designing is a competitive field that requires talent, training, and business ability, and many applicants vie for the better

jobs. Talented college graduates who major in interior design and graduates of professional schools of interior design will find the best opportunities for employment. Those with less talent or without formal training will find it increasingly difficult to enter this field.

Employment of interior designers is expected to increase about as fast as the average for all occupations through the mid-1980's. Growth in population, personal incomes, expenditures for home and office furnishings, and the increasing use of design services in both homes and commercial establishments should contribute to a greater demand for these workers. In addition to new jobs, some openings will be created by the need to replace designers who die, retire, or leave the field.

Department and furniture stores are expected to employ an increasing number of designers as their share in the growing volume of design work for commercial establishments and public buildings increases. Interior design firms also are expected to continue to expand.

Employment of interior designers, however, is sensitive to changes in general economic conditions because people often forego design services when the economy slows down.

Earnings and Working Conditions

Beginners are usually paid a straight salary plus a small commission. Starting salaries can range from $85 to $125 a week; firms in large metropolitan areas usually pay the higher salaries.

Some experienced interior designers are paid straight salaries, some receive salaries plus commissions based on the value of their sales, while others work entirely on commissions.

Incomes of experienced designers vary greatly. Many persons earn from $6,000 to $12,000 a year, while highly successful designers earn around $25,000 annually. A small number of nationally recognized professionals earn well over $50,000.

The earnings of self-employed designers vary widely depending on the volume of business, their professional prestige, the economic level of their clients, and their own business competence.

Designers' work hours are sometimes long and irregular. Designers usually adjust their work day to suit the needs of their clients, meeting with them during the evenings or on weekends, when necessary.

Sources of Additional Information

For information about careers in interior design and a list of schools offering programs in this field, contact:

American Society of Interior Design, 730 Fifth Ave., New York, N.Y. 10019.

Foundation for Interior Design Education Research, 1750 Old Meadow Rd., McLean, Va. 22101.

LANDSCAPE ARCHITECTS

(D.O.T. 019.081)

Nature of the Work

Everyone enjoys attractively designed private yards, public parks, and commercial areas. Landscape architects design these areas to fit in with people's needs and aesthetic sense.

Landscape architects assist many types of organizations in planning and designing a project from a real estate firm starting a new suburban development to a city constructing an airport or park. They may plan and arrange trees, shrubbery, walkways, open spaces, and other features as well as supervise the necessary grading, construction, and planting.

Landscape architects first consider the nature and purpose of the project, the funds available, and the proposed buildings in planning a site. Next, they study the site itself, mapping features such as the slope of the land and the position of existing buildings and trees. They also observe the sunny parts of the site at different times of the day, soil texture, existing utilities, and many other landscape features. Then, after consulting with the project architect or engineer they draw up plans to develop the site. If the plan is approved, landscape architects prepare working drawings showing all existing and proposed features such as buildings, roads, walkways, terraces, grading, and drainage structures in planted areas. Landscape architects outline in detail the methods of constructing features and draw up lists of building materials. They then may invite landscape contractors to bid for the work.

Although landscape architects help design and supervise a wide variety of projects, some specialize in certain types of projects such as parks and playgrounds, hotels and resorts, shopping centers, or public housing. Still others specialize in services such as regional planning and resource management, feasibility and cost studies, or site construction.

Places of Employment

More than 12,000 persons worked as landscape architects in 1974; less than 5 percent were women. Most landscape architects are self-employed or work for architectural, landscape architectural, or engineering firms. Government agencies concerned with forest management, water impoundment, public housing, city planning, urban renewal, highways, parks, and recreation employed about 40 percent of all landscape architects. The Federal Government employed about 500 landscape architects, mainly in the De-

partments of Agriculture, Defense, and Interior. Some landscape architects were employed by landscape contractors, and a few taught in colleges and universities.

Training, Other Qualifications, and Advancement

A bachelor's degree in landscape architecture which takes 4 or 5 years is usually the minimum educational requirement for entering the profession. In 1974 the American Society of Landscape Architects accredited 38 of the 66 colleges and universities offering this training.

Entrance requirements for landscape architecture programs vary by college. Some colleges recommend completion of a high school course in mechanical or geometrical drawing, and most schools advise high school students to take courses in art, botany, and more mathematics than the minimum required for college entrance.

College courses include technical subjects such as surveying, landscape construction, sketching, and city planning. Other courses include horticulture and botany as well as English, science, and mathematics. Most college programs also include field trips to view and study examples of landscape architecture.

Twenty-eight States require a license for independent practice of landscape architecture. Admission to the licensing examination usually requires a degree from an accredited school of landscape architecture plus 2 to 4 years of experience. Lengthy apprenticeship training (6-8 years) under an experienced landscape architect may sometimes be substituted for college training.

Persons planning careers in landscape architecture should be interested in art and nature. Self-employed landscape architects also must understand business practices. Working for landscape architects or landscape contractors during summer vacations helps a person understand the practical problems of the profession, and may be helpful in obtaining employment after graduation.

New graduates usually begin as junior drafters, tracing drawings and doing other simple drafting work. After gaining experience, they help prepare specifications and construction details and handle other aspects of project design. After 2 or 3 years they can usually carry a design through all stages of development. Highly qualified landscape architects may become associates in private firms; landscape architects who progress this far, however, often open their own office.

Employment Outlook

Employment of landscape architects is expected to grow at a much faster rate than the average for all occupations through the mid-1980's, resulting in hundreds of new positions each year. Additionally, new entrants will be needed as replacements for landscape architects who retire or die.

A major factor underlying the increased demand for landscape architects is the growing interest in city and regional environmental planning. Metropolitan areas will require landscape architects to develop land for the efficient and safe use of growing populations. Legislation to promote environmental protection could spur demand for landscape architects to participate in planning and designing a growing number of projects, such as transportation systems, outdoor recreation areas, and land reclamation.

Anticipated new construction may also increase demand for landscape architects. However, during slow periods the demand could be limited.

Earnings and Working Conditions

Though earnings fluctuate widely according to the educational background, experience, and size of the firm, landscape architects who own their own practice often earn more than salaried employees with considerable experience.

The Federal Government, in late 1974, paid new graduates with a bachelor's degree annual salaries of $8,500 or $10,520 depending on their qualifications. Those with an advanced degree had a starting salary of $12,841 a year. Landscape architects in the Federal Government averaged $21,000 a year.

Salaried employees both in government and in landscape architectural firms usually work regular hours, although employees in private firms may also work overtime during seasonal rush periods or to meet a deadline. Self-employed persons often work long hours.

Sources of Additional Information

Additional information including a list of colleges and universities offering accredited courses of study

in landscape architecture is available from:

American Society of Landscape Architecture, Inc., 1750 Old Meadow Rd., McLean, Va. 22101

For information on a career as a landscape architect in the Forest Service, write to:

U.S. Department of Agriculture, Forest Service, Washington, D.C. 20250

PHOTOGRAPHERS

(D.O.T. 143.062, .282, and .382)

Nature of the Work

Photographers use their cameras and film to portray people, places, and events much as a writer uses words. Those who are skillful can capture the personality of individuals or the mood of scenes they photograph. Some specialize in scientific, medical, or engineering photography and their pictures enable thousands of persons to see a world normally hidden from view.

Although their work varies widely, all photographers use the same basic equipment. The most important piece, of course, is the camera, and most photographers own several. Because the procedures involved in still photography are quite different from those in motion picture photography, most photographers specialize in one or the other. Unlike snapshot cameras which have a lens permanently attached to the camera body, professional cameras are constructed to use a variety of lenses designed for close-up, medium-range, or distance photography.

Besides cameras and lenses, photographers use a variety of film and colored filters to obtain the desired effect under different lighting conditions. When taking pictures indoors or after dark, they use electronic flash units, floodlights, reflectors, and other special lighting equipment.

Some photographers develop and print their own photographs in the darkroom and may enlarge or otherwise alter the basic image. Other photographers send their work to photographic laboratories for processing.

In addition to knowing how to use their equipment and materials, photographers must know how to compose the subjects of their photographs and be able to recognize a potentially good photograph.

Many photographers specialize in a particular type of photography such as portrait, commercial, or industrial work. Portrait photographers take pictures of individuals or groups of persons and usually work in their own studios. For special events, such as weddings or christenings, however, they take photographs in churches and homes. Commercial photographers generally take pictures to advertise clothing, automobiles, furniture, food, and other items. The work of industrial photographers is used in company publications to report to stockholders or to advertise company products or services. These photographers also may take motion pictures of workers operating equipment and machinery for management's use in analyzing production or work methods.

Other photographic specialties include photojournalism or press photography that combines a "nose for news" with photographic ability; aerial photography; educational photography (preparing slides, filmstrips, and movies for use in the classroom); and science and engineering photography (the development of photographic techniques for use in space, medical, or biological research).

Places of Employment

About 80,000 photographers were employed in 1974. About half worked in commercial studios, but newspaper and magazine publishers also employed many photographers. Government agencies, photographic equipment suppliers and dealers, and many industrial firms employed large numbers of these workers. In addition, some photographers taught in colleges and universities, or made films. Still others worked freelance, taking pictures to sell to advertisers, magazines, and other customers. About one-fourth of all photographers were self-employed.

Jobs for photographers are found in all parts of the country, in small towns and large cities, but employment is concentrated in the most populated areas.

Training, Other Qualifications, and Advancement

People may prepare for work as professional photographers in a commercial studio, through 2 or 3 years of on-the-job training. Trainees generally start in the darkroom where they learn to develop film and do photo-printing and enlarging. Later they may set up lights and cameras, or help an experienced photographer take pictures.

Photographic training also is available in colleges, universities, junior colleges, and art schools. About 25 colleges and universities offer 4-year curriculums, leading to a bachelor's degree in photography that include courses in the liberal arts. Some colleges and unversities grant master's degrees in specialized areas, such as color photography. In addition, a few colleges have 2-year curriculums leading to a certificate or an associate's degree in photography. Art schools offer useful training in design and composition, but not the technical training needed for professional photographic work. (See the statement on Commercial Artists elsewhere in the *Handbook*.) The Armed Forces also trains many young people in photographic skills during service.

The type of training determines the type of work for which prospective photographers qualify. Amateur experience is helpful in getting an entry job in a commercial studio, but post-high school training and experience usually are needed for industrial, news, or scientific photography. Work in scientific, medical, and engineering research, such as photographing microscopic organisms, requires a background in the particular science or engineering specialty, as well as skill in photography.

Photographers must have good eyesight and color vision, artistic ability, and manual dexterity. Some knowledge of mathematics, physics, and chemistry is helpful for understanding the use of various lenses, films, light sources, and development processes. They also should enjoy working with detail.

Some photographic specialties require additional qualities. Commercial or freelance photographers must be imaginative and original in their thinking. Those who specialize in photographing news stories must be able to recognize a potentially good photograph and act quickly or an opportunity to capture an important event on film may be lost. Photographers who specialize in portrait photography need the ability to help people relax in front of the camera.

Newly hired photographers are given relatively routine assignments that do not require split-second camera adjustments or decisions on what subject matter to photograph. News photographers, for example, may be assigned to cover civic meetings or photograph snow storms. After gaining experience they advance to more demanding assignments and some may move to staff positions on national news magazines. Photographers with exceptional ability may gain national reputations for their work and often exhibit their photographs in art and photographic galleries, or publish them in books. A few industrial or science photographers may be promoted to supervisory positions. Magazine photographers may become heads of graphic arts departments or photography editors.

Employment Outlook

Employment of photographers is expected to grow about as fast as the average for all occupations through the mid-1980's. In addition to openings resulting from growth, many others will occur each year as workers die, retire, or transfer to other occupations.

Job opportunities in newspapers and magazines should continue to be good for persons with college training in photography. Business and industry also will offer good opportunities for photographers as greater importance is placed on visual aids for use in meetings, stockholders' reports, and sales campaigns. Photography is becoming an increasingly important part of scientific and medical research, and opportunities are expected to be good for persons with the highly specialized background this type of work requires.

Competition for jobs as portrait and commercial photographers, however, is expected to be keen. These fields are relatively crowded since photographers can go into business for themselves with a modest financial investment, or work part time while holding another job.

Earnings and Working Conditions

Beginning photographers generally earned from $100 to $125 a week in 1974, according to the limited information available.

Those who worked for newspapers that have contracts

with the Newspaper Guild had weekly earnings between $104 and $359 in 1974, with the majority falling in the $150 to $200 range.

Newspaper photographers with some experience (usually 4 to 6 years) averaged about $265 a week in 1974. Contract minimums for experienced photographers were seldom less than $200 a week. A number of newspapers paid their photographers $300 a week or more, with the top salary over $420.

Photographers in the Federal Government earned an average of $13,970 a year in 1974. Depending on their level of experience, newly hired photographers earned from $7,600 to $10,520 a year and most experienced photographers earned between $12,840 and $18,460.

Many experienced photographers with established reputations earn salaries that are above the average for nonsupervisory workers in private industry, except farming. Although self-employed and freelance photographers often earn more than salaried workers, their earnings are affected greatly by general business conditons and the type and size of their community and clientele.

Photographers who have salaried jobs usually work the standard 5-day, 40-hour week and receive benefits such as paid holidays, vacations, and sick leave. Those in business for themselves usually work longer hours. Freelance, press, and commercial photographers travel frequently and may have to work in uncomfortable surroundings. Sometimes the work can be dangerous, especially for news photographers assigned to cover stories on natural disasters or military conflicts.

Sources of Additional Information

Career information on photography is available from:

Photographic Art & Science Foundation, 1100 Executive Way, Des Plaines, Ill. 60018.

COMMUNICATIONS-RELATED OCCUPATIONS

Communication is important to people, either individually as citizens, workers, or employers, or collectively in groups, organizations, or government. This section of the *Handbook* describes four occupations that specialize in communications—interpreters, technical writers, newspaper reporters, and radio and television announcers.

Interpreters and technical writers work as intermediaries translating messages for people to understand: interpreters help people understand languages foreign to them; technical writers help people understand technical information. Newspaper reporters and radio and television announcers inform people about current events and happenings that might interest or affect them. Newspaper reporters gather information on events which they describe, analyze, and interpret in newspapers for rapid dissemination to large numbers of people. Radio and television announcers use electronic communications equipment to tell people of products and services they might obtain, current happenings, and other items of interest.

INTERPRETERS

(D.O.T. 137.268)

Nature of the Work

Interpreters help people of different nations and different cultures overcome language barriers by translating what has been said by one person into a language that can be understood by others.

There are two basic types of interpretation: simultaneous and consecutive. In simultaneous interpretation, the interpreter translates what is being said as the speaker continues to talk. This technique requires speed and fluency, and it is made possible by the use of electronic equipment. Conference interpreters often work in a glass-enclosed booth from which they can see the speaker. While listening through earphones to what is being said, they simultaneously give the translation by speaking into a microphone. People attending the conference who do not understand the language being spoken may listen to an interpreter's translation by simply pushing a button or turning a dial to get the translation in the language they know. Simultaneous interpretation is generally preferred for conferences, and the development of portable equipment has extended its use to other large-scale situations.

Consecutive interpretation also involves oral translation. However the speaker and the interpreter take turns speaking. A consecutive interpreter must have a good memory and generally needs to take notes of what is said to be certain to give a complete translation. The chief drawback of consecutive interpretation is that the process is time consuming, because the speaker must wait for the translation before proceeding.

Since interpreters are needed whenever people find language a barrier, their work involves a variety of topics and situations. They may be used, for example, to explain to a group of foreign visitors various aspects of American life, such as points of political or social interest, or they may be required to interpret highly technical speeches and discussions for medical or scientific gatherings. They may work at the United Nations, or find themselves in a courtroom or escorting foreign leaders or business people visiting the United States.

Places of Employment

An estimated 150 persons worked full time as interpreters in the United States in 1974. The largest single concentration of interpreters was at the United Nations in New York where over 60 people held full-time posts. Various other international organizations, located primarily in Washington, D.C., also employed regular staff interpreters. Within the Federal Government, the Departments of State and Justice were the major employers of full-time interpreters.

An estimated 450 persons worked as freelance interpreters. Freelance interpreters may work for various employers under short-term contracts. About four-fifths were under contract on a temporary basis to the Department of State and the Agency for International Development to serve as escort interpreters for foreign visitors to the United States. Some of these interpreters worked a great portion of the year; others

worked for only a few days. The remainder of the freelance interpreters constituted the freelance conference field. These interpreters provided for both the supplementary needs of the international and Federal agencies and for the periodic, short-term needs of various international conferences that are held in this country. Besides persons who work strictly as interpreters, many others do some interpretation work in the course of their jobs.

About one-half of the Nation's conference interpreters are women; most escort freelance workers, however, are men.

Training, Other Qualifications, and Advancement

A complete command of two languages or more is the usual requirement for becoming an interpreter. Interpreters must instantaneously call to mind words or idioms corresponding to the foreign ones. An extensive working vocabulary and ease in making the transition from one language structure to another are necessary.

Students who want to become interpreters should become fluent in several languages. Interpreters who work at the United Nations, for example, must know at least three of the five official U.N. languages: English, French, Spanish, Russian, and Chinese. Portuguese and, to some extent, Japanese and German are also valuable to interpreters in the United States.

Two schools in the United States offer special programs for interpreter training. Both require foreign language proficiency upon entry. The Georgetown University School of Languages and Linguistics in Washington, D.C. has a 1- or 2-year course of study leading to a Certificate of Proficiency. Applicants to Georgetown University must qualify on the basis of an oral aptitude test and satisfactory performance in a basic first-year college program. The Monterey Institute of Foreign Studies in Monterey, Calif., offers a 2-year program leading to a master's degree in Language and International Studies and a certificate from the Department of Translation and Interpretation. Applicants to the Monterey Institute must have a bachelor's degree with a language major, or its equivalent. Students also must pass a qualifying examination for the Interpreters Certificate Program.

Many individuals may qualify as interpreters principally on the basis of their foreign backgrounds for positions in which extensive experience and a broad education are not as crucial as for other types of interpretation. For example, consecutive interpreters employed by the Immigration and Naturalization Service of the U.S. Department of Justice serve primarily in interpreting legal proceedings, such as hearings for aliens.

Besides being proficient in languages, interpreters are expected to be generally well informed on a broad range of subjects, often including technical subjects such as medicine or scientific or industrial technology. Work as a translator may serve as a useful background in maintaining an up-to-date vocabulary in various specialized or technical areas. The experience of living abroad also is very important for an interpreter.

Although there is no standard requirement for entry into the profession, a university education usually is considered essential.

People interested in becoming interpreters should be articulate speakers and have good hearing. The exacting nature of this profession requires quickness, alertness, and a constant attention to accuracy. Working with all types of people requires good sense, tact, and the emotional stamina to deal with the tensions of the job. It is essential that interpreters maintain confidentiality in their work and that they give honest interpretations.

Advancement in the interpreting field is generally based on satisfactory service. There is some advancement from escort level interpreting to conference level work.

Employment Outlook

Interpreters may face competition for the limited number of openings. Little change is expected in the number of full-time interpreters through the mid-1980's. Most opportunities, therefore, should result from the need to replace workers who die, retire, or leave their jobs for other reasons. Experience has shown that any slight or sporadic increase in the demand for interpreters can be met by the existing pool of freelance workers. Only highly qualified applicants will find favorable employment opportunities.

Qualified interpreters also may find work abroad. For example, the demand for interpreters in Europe, where so many different languages are spoken, is greater than in the United States.

People who have linguistic abilities also may find some employment opportunities as translators. In fact, many interpreters find the ability to do translation work, if not requisite, an occupational asset. Foreign language competence also is important for careers in the fields of foreign service, international business, and language education.

Earnings and Working Conditions

Salaries of interpreters depend upon the type of interpreting done as well as the ability and performance of the individual. The tax-free annual starting salary for conference interpreters at the United Nations was $10,000 in 1974. Outstanding U.N. interpreters could expect to earn more than $20,000. Beginning salaries for interpreters in various other international organizations were about $9,000 a

year, according to the limited information available. In addition, international organizations often paid supplementary living and family allowances.

Junior interpreters who worked for the U.S. Department of State received $12,841 a year in late 1974. Starting salaries were somewhat lower for Government interpreters with limited education, experience, or skills.

In the freelance field, interpreters are paid on a daily basis. Conference interpreter salaries ranged from about $110 to $135 a day in late 1974, depending on experience. The U.S. Department of State paid a daily salary of $110.

Freelance escort interpreters received salaries ranging from about $36 to over $56 a day, based on the individual's skill and prior performance. Interpreters on assignment usually could expect to be paid for a 7-day week. Interpreters are paid transportation expenses by the employing agency and also receive an allowance to cover the cost of accommodations, meals, and other expenses incidental to their assignments.

The conditions under which interpreters work vary widely. In freelancing, there is little job security because of demand fluctuations, and the duration of various freelance assignments ranges from a few days for a typical conference to several weeks for some escort assignments. Although the hours interpreters work are not necessarily long, they are often irregular. In some instances, especially for escort freelance workers, a great deal of travel to a wide variety of locations is required.

Sources of Additional Information

Information on the interpreting profession is available from:

The American Association of Language Specialists, 1000 Connecticut Ave. NW., Suite 9, Washington, D.C. 20036.

For information on entry requirements and courses of study at the two schools offering specialized programs for interpreters, contact:

Division of Interpretation and Translation, School of Languages and Linguistics, Georgetown University, Washington, D.C. 20007.

Department of Translation and Interpretation, Monterey Institute of Foreign Studies, P.O. Box 1978, Monterey, Calif. 93940.

Information about employment opportunities is available from:

Language Services Division, U.S. Department of State, Washington, D.C. 20520.

Secretariat Recruitment Service, United Nations, New York, N.Y. 10017.

NEWSPAPER REPORTERS

(D.O.T. 132.268)

Nature of the Work

Newspaper reporters gather information on current events and use it to write stories for publication in daily or weekly newspapers. In covering events, they may interview people, review public records, attend news events, and do research. As a rule, reporters take notes or use electronic recording devices while collecting facts, and write their stories upon return to the office. Sometimes, to meet deadlines, they telephone their information or stories to other staff members known as "rewrite men," who write or transcribe the stories for them.

Large dailies frequently assign some reporters to "beats," such as police stations or the courts, to gather news originating in these places. General assignment reporters handle various types of local news, such as a story about a lost child or an obituary of a community leader. Specialized reporters with a background in a particular subject interpret and analyze the news in fields such as medicine, politics, science, education, business, labor, and religion.

Reporters on small newspapers may cover not only all aspects of local news, but also may take photographs, write headlines, lay out pages, and write editorials. On some small weeklies, they also may solicit advertisements, sell subscriptions, and perform general office work.

Places of Employment

About 40,000 persons, two-fifths of them women, worked as newspaper reporters in 1974. The majority of reporters work for daily newspapers; others work for weekly papers and press services.

Reporters work in cities and towns of all sizes. Of the 1,775 daily and 7,650 weekly newspapers, the great majority are in medium-sized towns. However, most reporters work in cities, since big city dailies employ many reporters, whereas a smalltown paper generally employs only a few.

Training, Other Qualifications, and Advancement

Most newspapers will consider only applicants who have a college education. Graduate work is increasingly important. Many editors prefer graduates who have a degree in journalism, which usually provides a liberal arts education along with professional journalism training. Some editors consider a liberal arts degree sufficient. Others prefer applicants who have a liberal arts bachelor's degree and a master's degree in journalism. Although talented writers having little or no academic training beyond high school sometimes become reporters on city newspapers, most reporters without college training begin on rural, small-town, or suburban papers. High school courses that are useful include English, journalism, social science, and typing.

Bachelor's degree programs in journalism are available in more than 200 colleges. About three-

fourths of the courses in a typical undergraduate journalism curriculum are in liberal arts. Journalism courses include reporting, copyreading, editing, feature writing, history of journalism, law, and the relation of the press to society.

More than 500 junior colleges offer journalism programs. Twelve to fifteen hours of credit earned is transferable to most 4-year college programs in journalism. A few junior colleges also offer programs especially designed to prepare the student directly for employment as a general assignment reporter on a weekly or small daily newspaper. The Armed Forces also provide some training in journalism.

A graduate degree in journalism was offered by more than 75 schools in 1974. About one-fifth of those offer a doctoral degree in mass communications.

Persons who wish to prepare for newspaper work through a liberal arts curriculum should take English courses that include writing, as well as subjects such as sociology, political science, economics, history, psychology, and speech. Ability to read and speak a foreign language is desirable. Those who look forward to becoming technical writers or reporters in a specialized field such as science, should concentrate on course work in their subject matter areas. (See statement on Technical Writers.) Skill in typing is essential because reporters type their own news stories. On small papers, knowledge of news photography also is valuable.

The Newspaper Fund and individual newspapers offer summer internships that provide college students with an opportunity to practice the rudiments of reporting or editing. In addition, more than 2,500 journalism scholarships, fellowships, assistantships, and loans were awarded to college journalism students by universities, newspapers, and professional organizations in 1974.

News reporting involves a great deal of responsibility, since what a reporter writes frequently influences the opinion of the reading public. Reporters should be dedicated to serving the public's need for accurate and impartial news. Although reporters work as part of a team, they have an opportunity for self-expression. Important personal characteristics include a "nose for news," curiosity, persistence, initiative, resourcefulness, an accurate memory, and the physical stamina necessary for an active and often fast-paced life.

Some who compete for full-time reporter jobs find it is helpful to have had experience as a newspaper "stringer"—a part-time reporter who covers the news in a particular area of the community and is paid on the basis of the stories printed. Experience on a high school or college newspaper also is helpful in getting a job.

Many beginners start on weekly or on small daily newspapers where they acquire a broad range of reporting experience. Some college graduates are hired by large city papers as general assignment reporters while a few others start as copy editors. Beginning reporters usually are assigned duties such as reporting on civic and club meetings, summarizing speeches, writing obituaries, interviewing important visitors to the community, and covering police court proceedings. As they gain experience, they may report more important events, cover an assigned "beat," or specialize in a particular field.

Newspaper reporters may advance to reporting for larger papers or press services. Some experienced reporters become columnists, correspondents, editorial writers, editors, or top executives; these positions represent the top of the field and competition for them is keen. Other reporters transfer to related

fields such as public relations, writing for magazines, or preparing copy for radio and television news programs.

Employment Outlook

Beginners with exceptional writing talent are expected to find favorable employment opportunities through the mid-1980's. Others, however, will face strong competition for jobs, especially on large city dailies. Employment opportunities for reporters able to handle news about highly specialized scientific or technical subjects are expected to be favorable.

Weekly or daily newspapers located in small towns and suburban areas are expected to continue to offer the most opportunities for beginners entering newspaper reporting. Openings arise on these papers as reporters gain experience and move up to editing positions or transfer to reporting jobs on larger newspapers or to other types of work. Beginning reporters able to help with photography and other specialized aspects of newspaper work and who are acquainted with the community are likely to be given preference in employment on small papers.

In addition to jobs in newspaper reporting, recent college graduates who have journalism training may enter related fields such as advertising, public relations, trade and technical publishing, and radio and television. Good job opportunities also will be found in teaching journalism for those who have professional experience and at least a master's degree.

Although the broad field of mass communication should continue to expand due to rising levels of education; increasing expenditures for newspaper, radio, and television advertising; and a growing number of trade and technical journals, newspapers are not expected to share equally in this growth. As a result, employment of reporters should increase more slowly than the average for all occupations. Most job openings will continue to arise from the need to replace reporters who are promoted to editorial or administrative positions, transfer to other fields of work, retire, or leave the profession for other reasons.

Earnings and Working Conditions

Reporters working for daily newspapers having contracts negotiated by The Newspaper Guild had average starting salaries of $8,750 in late 1974. In general, earnings of newspaper reporters in 1974 were above average earnings received by nonsupervisory workers in private industry, except farming.

Minimum salaries of reporters having 4 or 5 years of experience who worked for daily newspapers with Guild contracts averaged $14,265 in 1974. The minimums ranged from $9,100, paid by the smallest dailies, to more than $22,000 paid by the largest. Many reporters, however, were paid salaries higher than these minimums. Reporters working for national wire services received annual salaries of at least $14,000.

Most newspaper reporters generally work a 5-day, 35- or 40-hour week. Reporters working for morning papers usually start work in the late afternoon and finish at about midnight. Most reporters also receive benefits such as paid vacations, group insurance, and pension plans.

Sources of Additional Information

Information about opportunities for reporters with daily newspapers is available from:

American Newspaper Publishers Association Foundation, P.O. Box 17407, Dulles International Airport, Washington, D.C. 20041.

For information on opportunities in the newspaper field and starting salaries of journalism graduates, as well as a list of journalism scholarships, fellowships, assistantships, and loans available at colleges and universities, write to:

The Newspaper Fund, Inc., Box 300, Princeton, N.J. 08540.

Information on union wage rates is available from:

The Newspaper Guild, Research and Information Department, 1125 15th St. NW., Washington, D.C. 20005.

For general information about careers in journalism contact:

American Council on Education for Journalism, School of Journalism, University of Missouri, Columbia, Mo. 65201.

Association For Education in Journalism, Murphy Hall, University of Minnesota, Minneapolis, Minn. 55455.

The Society of Professional Journalists, Sigma Delta Chi, 35 East Wacker Dr., Chicago, Ill. 60601.

Information on the opportunities for women in newspaper reporting and other communications fields is available from:

Women In Communications, Inc., 8305 A Shoal Creek Blvd., Austin, Tex. 78758.

Names and locations of daily newspapers and a list of schools and departments of journalism are published in the *Editor and Publisher International Year Book*, available in public libraries and in most large newspaper offices.

RADIO AND TELEVISION ANNOUNCERS

(D.O.T. 159.148)

Nature of the Work

Most radio announcers act as disc jockeys, introducing recorded music, presenting news and commercials, and commenting on other matters of interest to the audience. They may "ad-lib" much of the commentary, working without a detailed script. They also may operate the control board, sell time for commercials, and write commercial and news copy. In large sta-

tions, however, other workers handle these jobs. (See statement on radio and television broadcasting occupations elsewhere in the *Handbook*.)

Announcers employed by television stations and large radio stations usually specialize in particular kinds of announcing such as sports, news, or weather. They must be thoroughly familiar with their areas of specialization. If a written script is needed for parts of the program, the announcer may do the research and writing. Announcers frequently participate in community activities. A sportscaster, for example, might be the master of ceremonies at a touchdown club banquet or greet customers at the opening of a new sporting goods store. Some announcers become well-known and highly paid personalities.

Places of Employment

About 19,000 staff announcers were employed full time by commercial radio and television broadcasting stations in 1974. More than 80 percent of them worked in radio broadcasting. The average commercial radio or television station employed three announcers, although larger stations sometimes employed six or more. In addition to staff announcers, several thousand freelance announcers sell their services for individual assignments to networks and stations, or to advertising agencies and other independent producers.

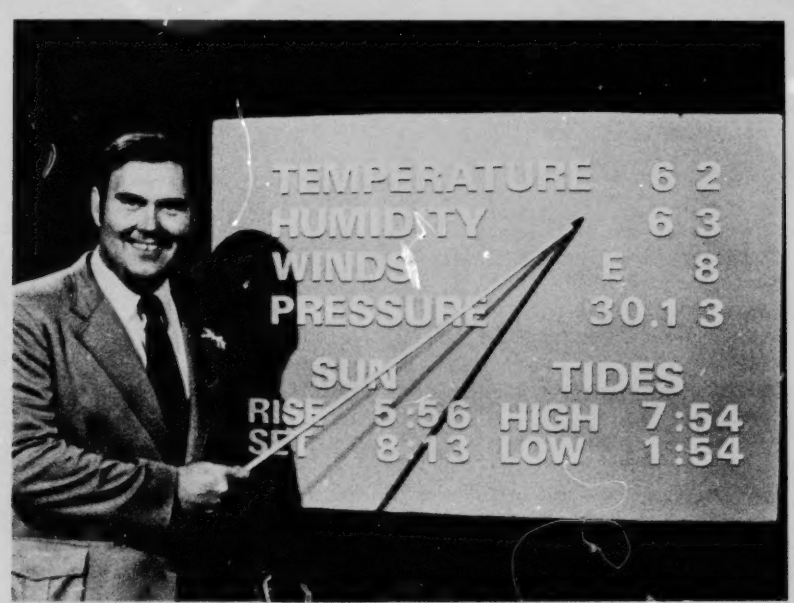
Training, Other Qualifications, and Advancement

Announcers must have a pleasant and well-controlled voice, a good sense of timing, and excellent pronunciation. Correct English usage and a knowledge of dramatics, sports, music, and current events improve chances for success. The most successful announcers have a combination of personality and a knack for dramatization that makes them attractive to audiences.

High school courses in English, public speaking, dramatics, foreign languages, and electronics, plus sports and music hobbies, are valuable background for prospective announcers. A college liberal arts education provides an excellent background for an announcer, and many universities offer courses of study in the broadcasting field. Students at these institutions also may gain valuable experience by supplementing their courses with part-time work at the campus radio station and summer work at local stations, filling in for vacationing staff members. A number of private vocational schools also offer training in announcing. However, those considering training at such a school should contact the personnel managers of stations and broadcasting trade organizations in their area to determine the school's performance in producing suitably trained candidates.

Most announcers get their first broadcasting jobs in small stations. Because announcers in small radio stations sometimes operate transmitters, prospective announcers often obtain an FCC Radiotelephone Third Class Operator License which enables them to operate a radio transmitter and, therefore, makes them much more useful to these stations. (For information on how to obtain a license, see the statement on broadcast technicians elsewhere in the *Handbook*.)

Announcers usually work in several different stations in the course of their careers. After acquiring experience at a station in a small community, an ambitious and talented announcer may move to a better paying job in a large city. An announcer also may advance by getting a regular program as a disc jockey, sportscaster, or other specialist. In the national networks, competition for jobs is intense, and announcers usually must be college graduates and have several years of successful announcing experience before they are given an audition.



Successful announcers have a personality which makes them attractive to audiences.

Employment Outlook

The employment of announcers

is expected to increase about as fast as the average for all occupations through the mid-1980's as new radio and television stations are licensed. Employment growth, however, will be limited by the increased use of automatic programming. Most job openings in this relatively small occupation will result from the need to replace experienced announcers who transfer to other occupations, retire, or die.

It will be easier to get an entry job in radio than in television because of the greater number of radio stations that hire beginners. These jobs generally will be located in small stations, and the pay will be relatively low. A few jobs also will become available as more cable television stations begin their own programming. However, the great attraction of the broadcasting field for young persons, and its relatively small size, will result in keen competition for entry jobs.

Earnings and Working Conditions

Salaries of beginning announcers in commercial television ranged from about $160 to $200 a week in 1974, and those of experienced announcers ranged from about $225 to $350, according to information from union contracts. Many well-known announcers earn much more. As a rule, salaries increase with the size of the community and the station, and salaries in television are higher than those in radio. Announcers employed by educational broadcasting stations generally earn less than those who work for commercial stations.

Most announcers in large stations work a 40-hour week and receive overtime pay for work beyond 40 hours. In small stations, many announcers work 4 to 12 hours of overtime each week. Working hours consist of both time on the air and time spent in preparing for broadcasts. Evening, night, weekend, and holiday duty occurs frequently since many stations broadcast 24 hours a day, 7 days a week.

Working conditions are usually pleasant because of the variety of work and the many personal contacts that are part of the job. Announcers also receive some satisfaction from becoming well known in the area their station serves.

Sources of Additional Information

For general career information, write to:

National Association of Broadcasters, 1771 N St. NW., Washington, D.C. 20036.

Corporation for Public Broadcasting, 888 16th St. NW., Washington, D.C. 20006.

TECHNICAL WRITERS

(D.O.T. 139.288)

Nature of the Work

Technical writers organize, write, and edit materials about science and technology in order to establish clearer communication between those who develop information—scientists, engineers, and design technicians—and the users of their information—operators, repairers, scientists, engineers, executives, or consumers. Their writing must always be clear and easy to follow, and when it is to be used by specialists it often must include technical detail and a highly specialized vocabulary. Technical writers usually arrange for the preparation of tables, charts, illustrations, and other artwork, and may work with technical illustrators, drafters, or photographers.

Before starting a writing assignment, technical writers usually learn as much as they can about their subject. This process involves studying reports, reading technical journals, and consulting with the engineers, scientists, and other technical personnel who have worked on the project. Then they prepare a rough draft that may be revised several times before it is accepted in final form.

The technical writer's product takes many forms—publicity releases on a company's scientific or technical achievements, manufacturers' contract proposals to government agencies, manuals that explain how to operate, assemble, disassemble, maintain, or overhaul components of a missile system or a home appliance, or articles for scientific and engineering periodicals or popular magazines.

Places of Employment

An estimated 20,000 technical writers and editors—about one-fifth women—were employed in 1974. Many technical writers are employed in the electronic and aerospace industries. Some work for research and development firms or for the Federal Government—mainly in the Departments of Defense and Agriculture, the Energy Research and Development Administration, and the National Aeronautics and Space Administration. Others work in firms that specialize in technical writing. A few are in business for themselves as freelance technical writers.

Technical writers are employed all over the country but the largest concentrations are in the Northeastern States, Texas, and California.

Training, Other Qualifications, and Advancement

Although there are no prescribed requirements for entry into the technical writing field, a combination of technical experience and writing ability will generally qualify a person to work as a technical writer.

While a college background is helpful and sometimes necessary, most technical writers do not enter

Technical writers discuss specifications of fighter plane component to be included in technical manual.

the occupation as recent college graduates. The majority, whatever their level of educational attainment, work initially as technicians, scientists, or engineers. In time, usually as a part of their technical assignment, they assume some writing duties, and develop technical communication skills. Eventually they decide to work entirely in technical writing.

Some employers, however, demand a 4-year college education. Many prefer the applicant to have a degree in science or engineering, with a strong background in English, while others emphasize writing ability.

In 1974, 12 colleges and universities offered 4-year programs leading to a bachelor's degree in technical writing, technical communication, or technical journalism; three schools offered graduate work and degrees in the field. More than 400 4-year colleges offered at least one course in technical writing as part of the regular curriculum. Almost all colleges, and some engineering schools, offer English courses to sharpen writing skills, and some conduct summer workshops and short-term seminars for technical writers.

Besides having writing skills, technical writers should be able to think logically, understand scientific and technical concepts, and do detailed and accurate work. They should be able to work and talk easily with others since they often work as part of a team. At other times, however, technical writers must work alone with little or no supervision, so they must be able to accept responsibility and exercise initiative.

Beginners often assist experienced technical writers by doing library research, and by preparing drafts of reports. Experienced writers in organizations that have large technical writing staffs may advance to technical editor or other supervisory and administrative positions. After gaining experience and contacts, a few go into business for themselves. It also is possible to advance by becoming a specialist in a particular scientific or technical subject. These writers sometimes prepare syndicated newspaper columns or articles for popular magazines.

Employment Outlook

Employment of technical writers is expected to increase about as fast as the average for all occupations through the mid-1980's. In addition to openings due to growth, opportunities will result from the need to replace those who die, retire, or transfer to other occupations. Employment opportunities will be best for experienced technical writers and for beginners who have good writing ability and the appropriate technical education. Those with only minimum qualifications, however, may face stiff competition for beginning jobs.

Requirements for technical writers are expected to increase because of the need to put the growing amount of scientific and technical information into language that can be understood by managers for decisionmaking and by technicians for operating and maintaining complex industrial equipment. Since many products will continue to be assembled from components manufactured by different companies, technical writers also will be needed to describe, in simple terms, how the components fit together. Others will be needed to improve and simplify operating and maintenance instructions for consumer products.

However, since many technical writers work in defense- and space-

related activities, including research and development, future job opportunities are related to government expenditures in these areas. Through the mid-1980's, R & D expenditures of Government and industry are expected to increase, although at a slower rate than during the 1960's.

Technical writers, as discussed in this statement, include only those persons whose primary job is to write about, interpret and edit technical subject matter. Those primarily employed as scientists, engineers or other technical specialists who may do a considerable amount of writing are not covered here. As technology becomes increasingly complex, more writing assignments may require technical and scientific knowledge equivalent to that of an engineer or scientist.

Technical writers who have training in journalism may find opportunities in other fields that employ writers such as advertising, public relations, trade publishing, and television and radio broadcasting.

Earnings and Working Conditions

Technical writers have high earnings compared with average earnings for nonsupervisory workers in private industry, except farming. Salaries of technical writers depend not only on ability, education, and experience, but also on the type, size, and location of their employing firm.

Starting salaries in 1974 ranged from about $7,000 a year for those with minimal qualifications to over $15,000 a year for those with technical experience and college education. Experienced technical writers average around $17,500 a year, while those in supervisory positions earned $20,000 or more.

Earnings of freelance writers vary greatly and depend on the writer's ability and reputation.

In the Federal Government in late 1974, inexperienced technical writers with a bachelor's degree and about five science courses could start at either $8,500 or $10,520 a year, depending on their college grades. Those with 2 years of experience could start at $12,841 and with 3 years of experience, $15,481.

Technical writers generally work in clean well-lighted places, though they may work under considerable pressure, frequently working overtime when a publication deadline has to be met.

Sources of Additional Information

For information about careers in technical writing, contact:

Society for Technical Communication, Inc., Suite 421, 1010 Vermont Ave. NW., Washington D.C. 20005.

THE OUTLOOK FOR INDUSTRIES

AGRICULTURE

Agriculture—broadly defined—is a genuine growth industry. It has become a vast and vital industry that reaches into all levels of society and into dozens of other industries and professions. It employs millions of persons—both professional and nonprofessional. For several decades, U.S. agriculture has been immersed in a technological revolution which has had a tremendous impact on the industry's labor force—both in numbers and composition. Agriculture, or agribusiness as it is more commonly referred to today, is a multifaceted complex that produces food and fiber and then assembles, processes, stores, transports, and markets it to meet ever-growing demands. Consumers now insist upon more attractively packaged and ready-to-cook foods. They also demand that it be available all year. Thus, science and business are as much a part of agriculture today as is farming. As a result, employment needs in agribusiness have changed significantly and will continue to change.

Tomorrow's agriculture and related natural resource management areas are expected to be more dynamic. They will offer many more and diverse kinds of employment opportunities. In addition, the U.S. Department of Agriculture has many diverse services organized to help increase the productivity of agriculture, to regulate practices, to protect the environment and the consumer, and to expand research and educational programs.

The ever-increasing technology has decreased the need for nonprofessional workers (farm or agribusiness laborers) while simultaneously increasing the need for professional workers (college-trained personnel). Present trends are expected to be amplified in the decades ahead. Enrollment in the 70 Land-Grant Colleges of Agriculture and Natural Resources increased from 35,000 in 1963 to 82,000 in 1974. A recent report showed an additional 33,000 agricultural students currently enrolled in the many non-land-grant 2- and 4-year colleges. Increased demand for food and fiber and continued public concern about the quality of the environment, proper management of our renewable natural resources, and consumer protection issues will cause these upward trends in college enrollment in agriculture and related fields to continue.

Opportunities on Farms

In brief, fewer farmers and farm workers will be needed to produce America's food and fiber products. For instance, in 1950 the average farmer could produce enough food and fiber for about 16 other persons. Today, each farmer feeds and clothes 53 other persons. By 1980, it is expected that each farmer will be able to produce enough for 65 persons.

Employment on U.S. farms and ranches has declined from 7.2 million in 1950 to nearly 3.5 million in 1974. By 1985, with a continued increase in size of farms and greater use of power and machinery, there are expected to be 2 million farm workers. Farm output has increased by 52 percent since 1950. This was accomplished with 17 percent fewer crop acres.

This phenomenal increase in farm productivity was accomplished by significantly increased use of farm power, machinery and equipment, higher application of fertilizers and other agrichemicals, improved crop varieties and strains of livestock, and improved farming practices in general. Farms increased in size and considerably more total capital is required of each farm operator. (See accompanying table.)

Management is the key to success in modern farming. Today's farmers need a much higher level of knowledge and skills than did their predecessors. For example, the dairy farmer used to feed each cow an amount of grain based on the amount of milk she had produced the previous day or week. Modern dairy farmers feed their cows on the basis of their potential—"pushing" potential high-performance cows to their limits, cutting back on expensive feed for cows that already have peaked out. Figuring the potential is a much more difficult technique than weighing milk.

The need for better trained farm operators and farm workers will increase as farming becomes more scientific. The knowledge and capital required to start farming a generation ago is no longer adequate. College training is becoming the rule rather than the exception for young "commercial" farmers. It gives them the technical basis that they need to keep up with new developments in research and technology and to apply them intelligently on their own farms. Biology, engineering, chemistry, and agronomy—not to mention economics, marketing, and accounting—are part of the necessary kit of tools for a successful farmer today.

Capital requirements are another obstacle the beginning farmer must overcome. It was estimated that the average commercial farm in 1974 had 470 acres, with a value of more than $190,000 in real estate,

livestock, crops, and equipment. Regionally, the estimated value of commercial farms varied from an average of $70,000 in Appalachia to $475,000 in the Pacific region.

For the person who has the training, the capital, and the management ability, the modern farm can offer much higher incomes than the old-style farm. Nevertheless, while agriculture production will still offer challenging and rewarding careers with larger incomes and better living conditions than it used to, it will offer them to fewer and fewer people.

Opportunities of Specific Types of Farms

Although the number of farms and farm jobs is decreasing, some desirable and rewarding opportunities remain in agriculture. The decision to enter farming may be made simply because an opening exists on the family farm or on a farm nearby. To be successful, however, young people should know the requirements of the specific type of farm operation they wish to enter. They should take into consideration their aptitudes, interests, preferences, experience, knowledge, and skills in directing labor and handling livestock and machinery. Young people also must consider family labor supply and financial resources, as the labor and capital requirements for an operation of adequate size vary widely from one type of farm to another.

A realistic decision to go into farming can be made only in terms of a particular area or community. This section evaluates, from an occupational standpoint, some of the more common types of farms. The accompanying table gives illustrative data on size of farm, capital requirements, and net farm incomes received by operators of typical or representative farms in various parts of the country. Many farms are larger than these and offer more return than is shown here. Some are smaller and offer the operators little income or opportunity to improve their status without major changes. On most of the farms, the major part of the work is done by the farm operators and their families. Whereas some of the smaller farms hire workers only during the peak labor season, large ones often use hired labor the whole year.

Table 1. Average size of farm by product and location, capital invested, and net farm income on commercial farms, 1974

Type of farms and location	Size of farm as measured by	Land and buildings	Capital invested in—			Net farm income
			Machinery and equipment	Livestock	Crops	Total	
Dairy farms:							
Central New York	40 milk cows	$61,200	$25,347	$23,547	$16,764	$126,855	$15,364
Southeastern Wisconsin	40 milk cows	120,212	26,593	25,436	18,352	190,593	19,857
Egg-producing farms, New Jersey	5,550 layer chickens	66,280	3,655	9,596	0	79,531	6,043
Broiler farms, Georgia	44,600 produced annually	33,109	6,615	991	330	41,045	2,663
Corn Belt farms:							
Hog-beef feeding	280 acres of cropland	226,440	28,119	49,536	43,302	347,397	14,749
Cash grain crop	375 acres of cropland	428,400	45,526	0	6,186	480,112	30,423
Cotton farms							
Mississippi Delta	900 acres of cropland	694,237	102,367	0	0	796,604	100,017
Southern High Plains, Texas:							
Irrigated	870 acres of cropland	632,961	54,899	0	0	687,860	73,412
Nonirrigated	860 acres of cropland	296,437	21,558	0	0	317,995	66,810
Tobacco farms, Coastal Plain, North Carolina	50 acres of cropland	67,106	7,391	783	1,423	76,703	7,837
Tobacco-livestock farms, Bluegrass area, Kentucky	64 acres of cropland	188,190	9,400	12,119	4,722	214,431	14,950
Wheat-fallow farms:							
Northern Plains	1,800 acres of cropland	303,705	53,560	0	0	357,265	30,694
Central Plains	1,800 acres of cropland	379,440	53,560	0	0	433,000	63,334
Pacific Northwest	1,800 acres of cropland	548,505	66,950	0	0	615,455	69,484
Cattle ranches							
Northern Plains	307 beef cows	513,254	27,677	107,896	10,661	659,488	34,714
Northern Rocky Mountain	314 beef cows	342,491	26,271	100,616	20,702	490,080	34,272
Southwest	278 beef cows	678,356	16,416	91,434	0	786,206	11,319
Migratory-Sheep Ranches, Utah-Nevada	2,025 breeding ewes	205,571	20,286	91,757	2,846	320,460	27,163

[1] The information presented here is on an owner-operated basis, primarily for comparability between types of farm. Net farm income is the combined return to total capital plus return to operator and other unpaid members of the family for their labor and management. No allowance has been made for payment of rent, interest, or mortgage.

SOURCE: Prepared in the Commodity Economics Division, Economic Research Division, U.S. Department of Agriculture.

The figures in the table on capital invested mean that the operator controls or uses resources valued at that amount. Many farmers supplement their own capital with borrowed funds; others rent part or all of the land they use, thus reserving more of their funds for the purchase of livestock, feed, machinery, and equipment. Still others have partners who provide most of the working capital. For example, many farmers who raise broilers are in partnership with a feed dealer.

No brief general statement can be made about specialization versus diversification in farming operations that would apply in all parts of the country. The general trend favors more specialized farming. Farms that produced many products a generation ago now may produce only two or three. Efficient production of most farm products requires a substantial investment in specialized equipment. To receive the full benefit from this investment, the farmer must produce on a large scale. Two other factors contributing to specialization are the increased emphasis on quality of farm products, and the greater knowledge and skill required for effective production. Few farmers, however, find it advantageous to produce only one product. The main reasons for producing more than one product are the desirability of spreading risk, the more effective use of labor (particularly family labor), and the fuller utilization of most other resources than can be realized in a one-product system.

Dairy Farms

While dairy farms are located throughout the country, their greatest concentration is near large population centers. There is work to be done every day thoughout the year on dairy farms, and they tend to be family operations. However, some farms are large enough so that more than one worker is required to handle the chores and equipment. In this way, the work can be divided up to allow some workers to take a day off.

Dairy farmers who produce their own feed have a variety of jobs to accomplish. Dairy herds are decreasing in number, but are becoming larger and more productive each year. Income from dairying is distributed somewhat evenly throughout the year.

Livestock Farms (Other Than Dairy and Poultry)

A livestock farm may handle only beef, swine, sheep, or horses. But it also may combine all of these enterprises. Persons who like livestock and who have developed some skills and knowledge about them and the mechanical equipment necessary for handling these farms can find livestock production rewarding and profitable. Farm chores tend to be more flexible than on dairy farms. Most labor tends to be family labor.

Various systems of livestock production allow for some specialization so that the system can fit the size of farm, the types of feed production available locally, and the needs of consumers. Incomes on livestock farms tend to be variable, and risks are quite high. Capital investments in housing and livestock can be considerable. Ability to understand the markets and to adjust management practices to changing costs and prices is the key to success in livestock production.

Poultry Farms

Poultry farms concentrate on egg production or on the production of broilers. Poultry farmers do not raise their own feed. They purchase feeds which are suited to their specific purposes. As in many farming enterprises, poultry farming requires specialized skill. The handling of the birds and of the mechanical feeding equipment requires specialized knowledge but usually not much physical strength. Poultry farms often make considerable use of family help.

Poultry farmers often experience sharp year-to-year fluctuations in income. These operations have high cash costs and thin profit margins. Many broiler producers have contracts with a financing agency such as a feed dealer, so that the profit margin can be somewhat dependable.

Cash Grain Farms

The production of corn, wheat, grain sorghums, and other grains requires the use of tractors, farm machinery, and equipment. For many of these farms the work requirements are seasonal. That is, during the soil preparation, planting, and harvesting times the farm operators are very busy. During other seasons and in slack periods the farmer often will seek employment off the farm.

Knowledge of farm machinery, seed bed preparation, varieties, planting times, depths, as well as methods of weed, insect, and disease control are required if producers are to be successful. Cash grain farmers are subject to major risks due both to weather and prices for their grains. This is particularly true for specialized crop farmers. Investments in land, power, and equipment on the usually large acreage can be very high. Thus, total risk is very high and management is critical.

Cotton, Tobacco, and Peanut Farms

Cotton, tobacco, and peanuts are grown on farms of varying size, depending upon the region. As in many other products, growers have been forced to enlarge their acreage and often to diversify. Still many farms are small and are part-time farming operations.

Some of the cotton farms, particularly in the West and Southwest, have gone under irrigation. Other

such farms in the Southeast have added beef cattle or poultry to their farming operations. Prices of these crops are usually government supported, so price risks tend to be less than for other cash-grain farms.

Specialty Crop Farms

Specialty crop farms may produce potatoes, grapes, oranges, sugar cane, melons, broomcorn, popcorn, or a combination of these and other specialty crops. These farms exist because of the demand for the product and because of the unique background, skills, and resources which a farmer has for this kind of production. These enterprises often require seasonal workers and relatively expensive specialized equipment. These producers need specific skills which may be obtained through experience or through special training.

Profits from specialty farms usually vary greatly from year-to-year. Specialty crop farmers usually study the demand picture well and make adjustments so that the particular operation will produce according to the effective demand.

Private Outdoor Recreation Farms

Since the demand for outdoor recreation facilities exceeds the supply, many farm operators in the vicinity of national, State, and local parks, or near wildlife preserves, have taken advantage of their location to establish recreation businesses. These farmers sell hunting or fishing rights to individuals, form hunting clubs, or establish private campgrounds. Some will enlarge or improve their farm ponds or irrigation reservoirs which they then stock with fish or make available for swimming and boating. Old farm buildings, sheds, and barns may be converted into riding stables or horse boarding stables. In making these facilities available, many farmers have converted a liability into an asset. Such farmers only represent 1 percent of all farms in the United States but their numbers are increasing. The average amount reported earned from such recreation activity was about $1,630 per farm. For persons with recreational interests in favored locations, this type of supplemental recreational enterprise can add substantially to farm income.

Other Specialty Farms

Agriculture also includes such specialized areas as nurseries, greenhouses, honey bees, fur farms, and riding stables. For many of these, special knowledge and skilled management are required. Risks are high—but, for persons who have the abilities and the resources, these ventures are often profitable and rewarding.

Training Opportunities Available for Farm Production Jobs

A good initial background in farming can be obtained by growing up on a successful farm. Necessary experience also may be gained by working as a closely supervised tenant or hired worker on a successful farm. In addition, college training in agriculture and agricultural business management is of sustantial value to the modern farmer.

Several types of vocational training are available under federally assisted programs. Training is offered in the following ways:

1. High school courses in agriculture.
2. Short courses for young farmers at colleges of agriculture, including intensive training in farm planning, farm structures, construction, welding and related shop and repair work, as well as instruction in crop production, livestock feeding and management, recordkeeping, and other aspects of farming.
3. Adult evening classes (or day classes in off-seasons) that provide intensive instruction in subjects such as land and soil management, crop and livestock production, new technology and equipment, and financial management.

Opportunities in Off-Farm Agribusinesses

The same technological revolution that hit the farm sector simultaneously extended itself into the off-farm agribusiness sector, altering farm product assembling, processing and handling practices. It changed the organizational structure of both the farm and off-farm sectors of today's modern agriculture. These technologies significantly increased the capital requirements of the off-farm sector. It also called for much greater managerial and technical knowledge and skills on the part of both professional and nonprofessional workers in the total agricultural complex. As a result, the number and kinds of personnel needed in the off-farm agribusiness labor force have changed significantly over the past three decades and they are likely to continue to change.

For example, as farms increase in size, more and more custom services will be used by farm operators. Operating this custom equipment will require special training and skills. Thus, there will continue to be a wide range of occupations which require technical knowledge below that required at the 4-year college level. Many 2-year community-junior colleges and vocational and technical schools now provide excellent training to meet these needs. Examples of such jobs include assistant feedlot managers, feed mill supervisors, general farm and ranch managers, irrigation system servicers, farm service center assistant managers, fertilizer and pesticide applicators, farm welders, petroleum distributors, diesel mechanics, agricultural accountants, elevator operators, fertilizer bulk blending plant assistant managers, and artificial inseminators.

Persons with 4-year bachelor's

degrees in agriculture will be increasingly needed in the off-farm agribusiness professional occupations. Nearly one-half of 4-year agriculture college graduates are now employed in off-farm positions in agribusiness. They have taken jobs such as sales and technical service center managers with agricultural supply firms selling feed, seed, fertilizer, agrichemicals, power, machinery, equipment and farm building supplies.

Others have taken jobs as buyers for meatpackers and other food processors; in advertising and public relations work; in management positions with agricultural product assembly, storage, processing and marketing firms operating in both the United States and abroad. Some take jobs with farm cooperatives, food chains, dairy product distributors, and farm credit agencies. Others work as agricultural consultants, economic analysts, field contractors, agricultural attaches, insurance specialists, farm appraisers, agrichemical applicators, inspectors of food processing plants, landscape architects, farm magazine writers, farm radio and TV broadcasters, and meat and grain inspectors and graders.

Occupations in the Public Sector of Agriculture

The public service sector of agriculture provides employment opportunities for College of Agriculture bachelor's degree graduates in positions as soil conservationists, vocational agriculture teachers, county extension directors, 4-H agents, rural and community planners, Farm and Home Administration supervisors, Department of Agriculture inspectors, Crop and Livestock Reporting Service employees, Peace Corps workers, vocational technical school teachers, agricultural market reporters, and agricultural attaches.

Those having advanced degrees in agriculture (master's and Ph. D. degrees) qualify for positions as educators, industry research and development scientists, agribusiness managers and upper level administrators, veterinarians, and researchers or administrators with governmental agencies such as the U.S. Department of Agriculture. In addtion to the governmental agencies, numerous private foundations also employ agricultural scientists, technicians, and administrators. (For more detail, see section on agriculture-related professional occupations.)

Occupations in Renewable Natural Resource Management

Proper management of our renewable natural resources is a national obligation. It involves the wise use of land and forests, water and minerals, and fish and wildlife. It involves preserving parks and other natural recreation areas (including unspoiled wilderness, virgin prairies, and scenic riverways).

Soil must be managed; timber must be used wisely; wildlife must be protected; water must be conserved and protected from pollution. Land use planning is becoming more important as public pressures build both to protect our farm land to produce more food and fiber and to devote more land to highways, urban development, mining and quarrying, lumbering, and recreation. People with more leisure time are voting for more park facilities and lakes, planned recreation programs, camping sites, hunting preserves, fishing facilities, and areas for water sports and nature studies.

Therefore, many opportunities are available for persons holding degrees from colleges of agriculture and natural resources (Forestry) in such curriculums as: Natural resource management, wildlife conservation, forestry, wood science and technology, environmental biology, fisheries biology, landscape architecture, horticulture, urban and regional planning, urban forestry, soil and water conservation, crop protection, pest management, park and recreational area management, land-use planning and range management. Many of these are relatively new college degree curriculums, brought on by greater public concern for proper management of the Nation's renewable natural resources and pressures to provide facilities for use of leisure time.

People trained in the above curriculums take jobs as park and recreation area managers, park rangers, regional park supervisors, outdoor recreation specialists, private recreation firm managers, soil and water conservationists, wildlife managers, foresters, forestry technicians, environmental biologists, range managers, fishery biologists, and land-use planners. (See the statement on Conservation Occupations elsewhere in the *Handbook.*) Some work in urban agriculture—parks, zoos, botanical gardens, golf courses, open areas, and landscaping; and in city and county planning.

Sources of Additional Information

The most significant sources of information and guidance available to farmers are the services provided by the land-grant colleges and universities and the U.S. Department of Agriculture, Washington, D.C. 20250. These services include research, publication, teaching, and extension work. The county agricultural agent is often the best contact for the young person seeking advice and assistance in farming. The Farmers' Home Administration system of supervised credit is one example of credit facilities combined with a form of extension teaching. Organized groups, such as the Future Farmers of America and

the 4-H Clubs, also furnish valuable training to young farm people.

For information about opportunities in off-farm activities, contact individual colleges of agriculture or the U.S. Department of Agriculture, Washington, D.C. 20250.

AGRICULTURE-RELATED PROFESSIONAL OCCUPATIONS

Nature of the Work

The discussion that follows deals primarily with job categories that are generally termed professional fields. These occupations usually require at least a bachelor's degree, and master's and Ph. D. degrees are becoming increasingly necessary. Some of these jobs are discussed more fully elsewhere in the *Handbook*. (See index.)

Agricultural economists (D.O.T. 050.088) deal with problems related to production, financing, pricing, and marketing of farm products both in the United States and in foreign countries. These economists are factfinders, evaluators, analysts, and interpreters who provide economic information to farmers, agri-business firms, policymakers, consumers, and other interested persons. They provide cost-benefit analyses for evaluating farm programs at the National, State, and farm level. They study the effects of mechanization, technological advances, and other developments that influence the supply of and demand for farm products and the accompanying effects on costs and prices of farm products.

Agricultural engineers (D.O.T. 013.081) develop new and improved farm machines and equipment; deal with the physical aspects of soil and water problems in farming; design and supervise installation of systems for irrigation, watershed protection and flood prevention; devise new techniques for harvesting and processing farm products; and design more efficient farm buildings.

Agronomists (D.O.T. 040.081) are concerned with growing, breeding, and improving field crops such as cereals and grains, legumes and grasses, tobacco, cotton, and others. They do research also in the fundamental principles of plant sciences.

Animal physiologists (D.O.T. 041.081) study the functions of the animal body and any of its parts.

Animal scientists (D.O.T. 040.081) deal with production and management of farm animals. They are concerned with genetics, nutrition, breeding, physiology, environment, and animal health.

Veterinarians (D.O.T. 073.081) inspect livestock at public stockyards and points of entry into the United States; inspect establishments that produce veterinary biological supplies; administer tests for animal diseases; conduct programs for the control and eradication of animal disease; conduct research on livestock diseases and vaccines for disease control; work directly with farmers in protection or restoration of livestock health; and provide services for the health and care of small animals and pets.

Geneticists (D.O.T. 041.081) try to develop strains, varieties, breeds, and hybrids of plants and animals that are better suited than those presently available for the production of food and fiber.

Microbiologists (D.O.T. 041.081) study bacteria and the relation of other microorganisms to human, plant, and animal health and the function of these microorganisms in the making of products such as vitamins, antibiotics, amino acids, grain alcohol, sugars, and polymers.

Plant scientists (D.O.T. 041.081) study plant diseases and their nature, causes, and methods of control. They also study the structure of plants and the growth-related factors in plants. Methods of improving fruits, vegetables, flowers, and ornamental plants are also of major concern.

Plant quarantine and plant pest control inspectors (D.O.T. 041.081), who are trained in the biological sciences, supervise and perform professional and scientific work in enforcing plant quarantine and pest control laws. Plant quarantine inspectors inspect ships, planes, trucks, and autos coming into the country to keep out dangerous insect pests. Plant pest control inspectors conduct programs to protect the crops of the country by prompt detection, control, and eradication of plant pests.

Entomologists (D.O.T. 041.081) study insects both beneficial and harmful. They identify the populations and distributions of insects that injure growing crops and animals; that harm human beings; and that damage agricultural commodities during shipping, storage, processing, and distribution. Their research is directed toward finding means by which these harmful insects may be controlled, and desirable insects managed to increase their impact on pests.

Foresters (D.O.T. 040.081) are concerned with the protection, production, processing, and distribution of our timber resources. They also study means by which wood may be seasoned, preserved, and given new properties.

Human nutritionists (D.O.T. 077.128) are concerned with the science of food, nutrients, and other substances; their action, interaction, and balance in relation to health and disease; and the means by which the body utilizes these substances. They also study certain social, economic, cultural, and physiological implications of food and eating.

Rural sociologists (D.O.T. 054.088) study the structure and functions of the social institutions (customs, practices, and laws) that are a part of rural society or affect it.

School teachers (D.O.T. 091.228) in vocational agriculture and related fields supervise and give instruction in farm management, agricultural production, agricultural supplies and services, operation and repair of farm equipment and structures, inspection and processing of farm products, ornamental horticulture, conservation of natural resources, and uses of forests.

Farm managers, including agriculture management specialists, supervise and coordinate the production, marketing, and purchasing and credit activities of one farm or a group of farms.

Places of Employment

Government agencies, colleges, and agricultural experiment stations hire many agricultural research workers. They also hire people to take technical and administrative responsibilities in programs involving or affecting farmers such as the production, processing, marketing, inspection, and grading of farm products; prevention and spread of plant pests, animal parasites, and diseases; and management and control of wildlife.

States, counties, and municipalities hire many who serve as vocational agriculture teachers. Through a nationwide, federally aided program, teachers of vocational agriculture not only teach high school students interested in farming, but also provide organized instruction for adult farmers, giving individual consultation at their farms to keep them abreast of modern farm technology.

Agribusinesses, farmer cooperatives, and commercial and financial companies that buy from, sell to, or serve farmers also employ many professionals with agriculture-related training, as do farmers' organizations or trade associations whose members deal with farmers. Such companies and organizations tend to be located either in industrial centers or in areas of high agricultural activity, and include producers of feed, seed, fertilizer, and farm equipment; and of insecticides, herbicides, and other chemical dusts and sprays. Employment in these organizations may be expected to expand, as farmers rely increasingly on them to provide farm supplies, machinery, equipment, and services, and to market farm products. The size of the organization and the types of services it offers determine the number of its employees and the nature of their jobs. Large farm supply cooperatives and businesses, for example, may have separate divisions for feed, seed, fertilizer, petroleum, chemicals, farm machinery, public relations, and credit, each supervised by a department head. In smaller businesses and cooperatives, such as local grain-marketing elevators, the business is run almost entirely by the general manager who has only two or three helpers.

Research activities related to agriculture have grown very rapidly. The largest agencies in this field are the State agricultural experiment stations connected with the land-grant colleges and the various research branches of the U.S. Department of Agriculture. The U.S. Department of Agriculture employs workers in research positions in various parts of the country: in Washington, D.C.; at the Agricultural Research Center at Beltsville, Md.; and at land-grant colleges. Other Government departments also have many agricultural research jobs.

Public and private lending institutions which make loans to farmers employ people with broad training in agriculture and business. These workers ordinarily are required to have had practical farm experience, as well as academic training in agriculture, economics, and other subjects. Making financially sound loans involves careful analysis of the farm business and proper evaluation of farm real estate and other farm property. These workers are employed by the Cooperative Farm Credit Administration in its banks and in associations operating under its supervision throughout the country; by the Farmers Home Administration in its Washington, D.C. office, and in State and county offices throughout the country; by rural banks; and by insurance companies that have substantial investments in farm mortgages.

Agricultural communications is another expanding area of specialization. Crop reporters and market news reporters are employed by the U.S. Department of Agriculture in field offices throughout the United States. Crop reporters gather information on crop production during all stages of the growing season. Market news reporters collect information on the movement of agricultural produce from the farm to the market. Radio and TV farm directors are employed by many radio and TV stations to report prices, sales, grades, and other agricultural information to farm residents. Agricultural reporters and editors compile farm news and data for farm journals, bulletins, and broadcasts.

The qualifications of workers in all of these fields ordinarily include a college education and special training in a particular line of work. In most of these fields, the demand for workers exceeds the supply. In recent years, the demand has increased because of the need to recruit professional personnel to staff agricultural missions to other countries and to give technical aid to agricultural institutions and farmers there.

Sources of Additional Information

Opportunities in Research. Additional information on research opportunities at land-grant colleges may be obtained from the dean of agriculture at the State land-grant

college. Information on employment in the U.S. Department of Agriculture is available from the USDA recruitment representatives at land-grant colleges and from the Office of Personnel, U.S. Department of Agriculture, Washington, D.C. 20250.

The following publication will be valuable:

Careers in Agriculture and Natural Resources—Agriculture. American Association of Land-Grant Colleges and State Universities, Washington, D.C. Copies can be obtained free from State agricultural colleges.

Opportunities in Agricultural Finance. For information about employment opportunities in agricultural finance, contact:

Farm Credit Administration, Washington, D.C. 20578.

Farmers Home Administration, U.S. Department of Agriculture, Washington, D.C. 20250.

Agricultural Director, American Bankers Association, 90 Park Ave., New York, N.Y. 10016.

Opportunities with Cooperatives. Cooperatives in the individual communities are a good source of information on jobs either in their own organizations or in other cooperatives. Most States have a State Council or association of cooperatives that can provide information on cooperative locations and some job information.

The Cooperative Foundation, 59 E. Van Buren St., Chicago, Ill. 60605, offers a publication, *Careers in Cooperatives*, which describes about 100 different kinds of jobs available in these businesses.

Opportunities for Agricultural Economists. For additional information about opportunities in agricultural economics, write the Department of Agricultural Economics at State land-grant colleges. For information on Federal employment opportunities, applicants may get in touch with USDA recruitment representatives at the State land-grant college or write directly to the Office of Personnel, U.S. Department of Agriculture, Washington, D.C. 20250.

Opportunities as Vocational Agriculture Teachers. Prospective teachers should contact the Head Teacher Trainer in Agriculture Education at the land-grant college or the State Supervisor of Agricultural Education at the State Department of Public Instruction in their respective States.

MINING AND PETROLEUM

The mining and petroleum industry provides most of the basic raw materials and energy sources for industry and consumer use. Metal mines provide iron, copper, gold, and other ores. Quarrying and other nonmetallic mining yield many of the basic materials such as limestone and gravel for building schools, offices, homes, and highways. Nearly all of the Nation's energy for industrial and personal use comes from oil, gas, and coal. Few products from mines reach the consumer in their natural state; nearly all require further processing.

The mining and petroleum industry employed about 672,000 wage and salary workers in 1974. Over four-tenths of these worked in the exploration and removal of crude petroleum and natural gas. Coal mining accounted for about one-fourth of the industry's workers, and quarrying and nonmetallic mineral mining nearly one-fifth. The remaining workers were in metal mining.

As shown in the accompanying tabulation, blue-collar workers (craft workers and operatives) account for nearly seven-tenths of the industry's employment. Operatives are the largest occupational group in the industry. Included in the operative group are oil well drillers, mining machinery operators, and truck and tractor drivers. Skilled craft workers constitute the second largest occupational group. Mechanics and repairers maintain the complex equipment and machinery used in mining and in oil well drilling. Many operators of heavy equipment, such as power shovels and graders, work in open pit mining. Large numbers of pumpers, gaugers, and engine workers hold jobs in the removal and transportation of petroleum and natural gas. Supervisors of blue-collar workers also constitute an important part of the craft worker group.

The industry's white-collar employees are divided among three occupational groups—professional and technical, clerical, and managerial workers. Taken together, these groups compose the remaining three-tenths of the industry's employment.

Major occupational group	*Estimated employment, 1974 (percent distribution)*
All occupational groups	100
Professional, technical, and kindred workers	15
Managers and administrators	6
Clerical and kindred workers	10
Salesworkers	(1)
Craft and kindred workers	26
Operatives[2]	41
Service workers	2

[1] Less than 0.5 percent.
[2] Includes mine laborers.

Professional, technical, and kindred workers are concentrated largely in petroleum and gas extraction. Most are engineers, geologists, or technicians engaged in exploration and research. Two out of three clerical employees work in petroleum and gas extraction. Most are secretaries, office machine operators, and typists.

Employment in the mining and petroleum industry is expected to increase about as fast as the average for all industries through the mid-1980's, but different growth patterns are likely within the industry. Employment in coal mining and in petroleum and natural gas extraction should increase as the Nation strives to become self-sufficient in energy sources. Employment in metal mining also is expected to grow. Employment in quarrying and nonmetallic mining, on the other hand, is expected to decline as labor-saving equipment leads to higher output with fewer workers.

The statements that follow provide information on employment opportunities in the petroleum and natural gas extraction industry and the coal mining industry. More detailed information about many of the major occupations in the mining and petroleum industries also appears elsewhere in the *Handbook*.

COAL MINING

Nature of the Industry

Coal has played a vital role in the development of this Nation. Originally used only as a source of heat, the demand for coal grew rapidly with the coming of the steam engine. By the beginning of the 20th century coal emerged as a major ingredient in the production of steel and electric power.

Coal is usually divided into two classes, bituminous and anthracite. Bituminous, or "soft" coal, is the most widely used and the most plentiful, and accounts for most coal production. Production of anthracite, or "hard" coal, on the other hand, is steadily declining due to dwindling reserves and difficulty of recovery. Other forms of coal, such as lignite and peat, are classified in the subbituminous category, and are used in limited amounts.

Most of the Nation's coal is mined in the Appalachian area which extends from Pennsylvania through Eastern Ohio, West Virginia, Virginia, Kentucky, Tennessee, and Alabama. A large amount of coal also is mined in Indiana, Illinois, and in the Rocky Mountain States.

Types of Mines

Coal is either mined underground or extracted from the earth's surface. Underground mines produce slightly less than half of the bituminous coal and employ most of the miners. Surface mines account for the remaining coal, but employ only a small proportion of the industry's workers.

The type of mine a company decides to open depends on the geological formation and the depth and location of the coal seam. Underground mines are used to reach coal that lies deep below the surface. A series of entries must be constructed so that air, and miners and equipment can reach the seam and coal can be carried out. Depending on the depth of the coal seam, the entry may be vertical (shaft mine), horizontal (drift mine), or at an angle (slope mine). (See chart.) Shaft mines are used to reach coal lying far below the surface. Drift and slope mines are usually not as far underground as shaft mines.

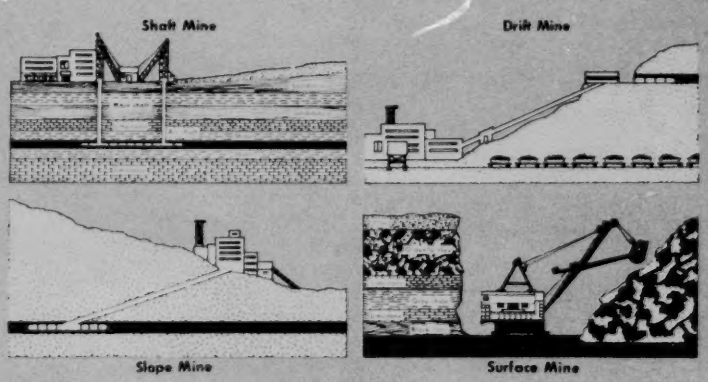
After the coal seam has been reached, nearly all underground mines are constructed the same way. Miners make a network of interconnecting tunnels so that the mine resembles a maze with passageways going off in predetermined directions, sometimes extending over many miles. As coal is removed, the tunnels become longer and longer. Throughout this process, a significant amount of coal (pillars) is left between the tunnels to support the roof. When miners reach the end of the company's property they start working back toward the entrance, mining most of the remaining coal as they retreat. This is called retreat mining.

If the coal seam is not too far below ground, surface mining is practiced. Two types of surface mines are strip and auger. At strip mines, huge machines tear the earth away and dig out the coal. Auger mining is used to remove coal from extremely steep hillsides. A large auger (drill) bores into the hill and pulls the coal out.

Occupations in the Industry

In 1974 about 169,000 people worked in the coal mining industry. About 85 percent were production workers who mined and processed coal. Mining jobs range from apprentice miners who usually act as helpers in several occupations, to highly skilled and experienced miners who operate equipment

Four Types of Bituminous Coal Mines 18



Source: Bureau of Labor Statistics

Miner runs a continuous mining machine which tears coal from the seam.

worth several hundred thousand dollars. Jobs available in a mine, however, vary by type and method of mining.

Mining Occupations. Two basic methods of mining underground coal, conventional and continuous, account for 96 percent of total underground production. A third method, longwall, makes up the remaining.

Conventional mining is the oldest method and requires the most workers and procedures. In conventional mining, the *cutting machine operator* (D.O.T. 930.883) uses a huge electric chainsaw, with a cutter ranging in length from 6 to 15 feet, to cut a strip, or kerf, underneath the coal seam to control the direction of the coal as it falls after it has been blasted. Next the *drilling machine operator* (D.O.T. 930.782) drills holes into the coal where the *shot firer* (D.O.T. 931.281) places explosives. After the blast, the *loading machine operator* (D.O.T. 932.883) scoops up and dumps the coal into small rubber-tired cars, which are run by the *shuttle car operator* (D.O.T. 932.883). Depending on the type of haulage system used, these cars take the coal to a conveyor belt for shipment to the main entry or to the surface, or onto mine cars which are transported on tracks to the surface.

The continuous mining method eliminates the drilling and blasting operations of conventional mining. The *continuous-mining machine operator* (D.O.T. 930.883) runs a machine that cuts or rips out the coal and loads it directly onto a conveyor or shuttle cars.

A miner moves a cutting machine into position at the coal face.

Longwall mining is basically an extension of continuous mining. In this method, the *longwall machine operator* runs a set of machines which cut and automatically load coal onto a conveyor. At the same time hydraulic jacks reinforce the roof. As the coal is cut and the face progresses, the jacks are hydraulically wrenched forward and the roof is allowed to cave behind.

Many other workers are required to run a safe and efficient underground mine. Before miners are allowed underground, the *fire boss* or preshift examiner (D.O.T. 939.387) inspects the work area for loose roof, dangerous gases and adequate ventilation. The *rock-dust machine operator* (D.O.T. 939.887) sprays limestone on the mine walls and ground to hold down dust since coal dust is extremely explosive, and interferes with breathing.

The *roof bolter* (D.O.T. 930.883) operates a machine to install roof support bolts. This operation is extremely important because of the ever-present threat of roof cave-ins. The *stopping builder* (D.O.T. 869.884) constructs doors, walls or partitions in the passageways to force air through the tunnels to working areas, and the supervisor, called a *face boss* (D.O.T. 939.138), is in charge of all operations at the work site where coal is actually mined.

Most surface miners operate the large machines that either remove the earth above the coal, or dig and load the coal. The number of workers required to operate a surface mine depends on the types of machines used and the amount of overburden above the coal seam. The more overburden present, the greater the number of workers usually required.

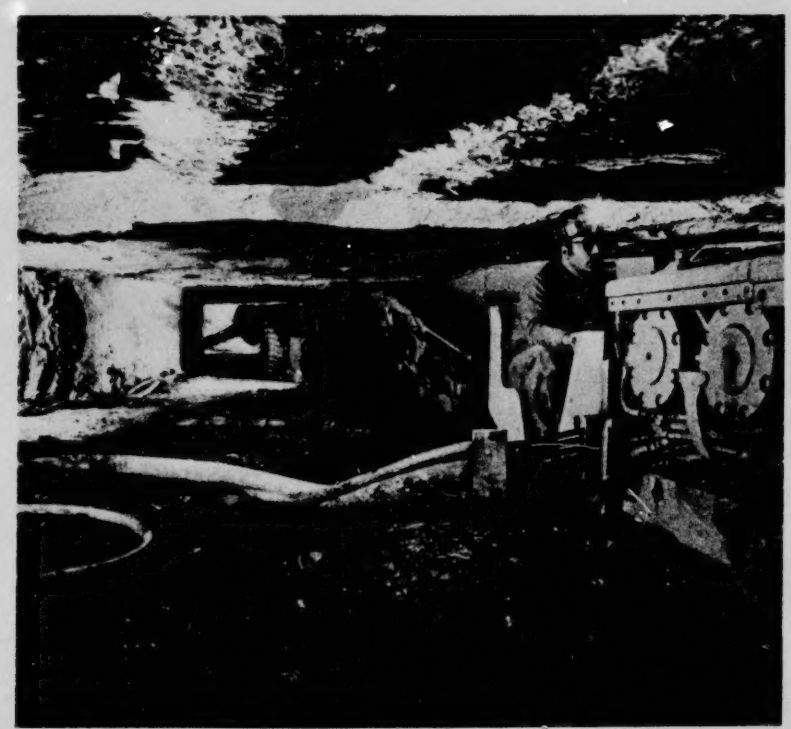
In many strip mines, the overburden is first drilled and blasted. Then the *overburden stripping operator* or *dragline operator* (D.O.T. 859.883) scoops the earth away to expose the coal. Next the *coal loading machine operator* (D.O.T. 932.883) rips coal

from the seam and, loads the coal into trucks to be driven to the preparation plant. In auger mines, the *rotary auger operator* (D.O.T. 930.782) runs the machine that pulls the coal from sides of hills. *Tractor operators* (D.O.T. 929.883) drive bulldozers to move materials or pull out imbedded boulders or other objects. Helpers assist in operating these machines.

Other workers, not directly involved in the mining processes, work in and around coal mines. For example, skilled repairers, called *fitters* (D.O.T. 801.281), fix all types of mining machinery, and electricians check and install electrical wiring. Carpenters construct and maintain benches, bins, and the wooden bodies of mine cars. Many mechanics and electricians assemble, maintain, and repair the machines used in mines. Truckdrivers haul coal to preparation plants and supplies to the mine.

Preparation Plant Occupations. Rocks and other impurities must be removed before coal is crushed, sized or blended, to meet the buyer's wishes. These processes take place at the preparation plant.

Many preparation plants are located next to the mine. The plant's size and number of employees vary by the amount of coal processed and degree of mechanization. Some plants have all controls centrally located and require only one worker to oversee all washing, separating, and crushing operations. This worker is known as a *preparation plant central control operator* (D.O.T. 549.138). Plants that are not as mechanized, however, need workers at each step, such as the *wash box attendant* (D.O.T. 541.782) and *separation tender* (D.O.T. 934.885). Wash box attendants operate equipment which size and separate impurities from coal. The separation tender operates a device that further cleans coal with currents of water.



Miner operates loading machine.

Administrative Professional, Clerical, and Technical Occupations. A wide range of administrative, professional, technical and clerical personnel work in the coal industry. At the top of the administrative group are executives who make all policy decisions. A staff of specialists, such as accountants, attorneys, and market researchers supply legal, technical, and market information for decisionmaking. Clerical and secretarial workers assist the administrative staff.

A variety of engineering and scientific personnel work in the coal industry. *Mining engineers* (D.O.T. 010.081 and .187) examine coal seams for depth and purity, determine the type of mine to be built, and supervise the construction and maintenance of mines. *Mechanical engineers* (D.O.T. 007.081, .151, .168, and .187; and 019.187) oversee the installation of equipment, such as centralized heat and water systems, while *safety engineers* (D.O.T. 010.181) are in charge of all health and safety programs.

The scientific staff conducts research on means to make coal a cleaner, more efficient, and more easily transportable energy source. Presently, many physicists, chemists, and geologists are studying feasible alternatives for converting coal into a gas or liquid.

Other technical personnel are required to assist scientists and engineers. For example, *surveyors* (D.O.T. 018.188) help map out the mining areas. Engineering and science technicians may assist in research efforts.

Training, Other Qualifications, and Advancement

Most miners start out as helpers to experienced workers and learn

skills on the job. Formal training, however, is becoming more important due to the growing use of technologically advanced machinery and mining methods. As a result, most companies supplement on-the-job training with formal programs and actively seek recent graduates of a program in mine technology.

Mine technology programs are available in a few colleges throughout the country, mostly in coal mining areas. The programs lead either to a certificate, after 1 year, or an associate degree, after 2 years, in mine technology. Courses cover areas such as mine ventilation, roof bolting, and machinery repairs. Prospective students do not need a high school education but must pass an entrance examination in basic math and English.

The type of formal training administered by coal companies varies. For example, some companies have training mines where skills are taught; others give classroom instruction for a few weeks before allowing workers into a mine.

Many courses also are available on health and safety procedures, mining techniques, and mining machinery. The U.S. Mining Enforcement and Safety Administration, coal companies, and the United Mine Workers of America conduct classes on health, safety, and mining methods. Mine machinery manufacturers offer courses in machine operation and maintenance.

As miners gain more experience, they can move to higher paying jobs. When a vacancy occurs, an announcement is posted and all workers qualified may bid for the job. A mining machine operator's helper, for example, may become an operator. The position is filled on the basis of seniority and ability. A small number of miners advance to supervisory positions and, in some cases, to administrative jobs in the office.

Miners must be at least 18 years old and in good physical condition. A high school diploma is not required. All miners should be able to work in close areas and have quick reflexes in emergencies.

Requirements for scientific and engineering, administrative, and clerical jobs are similar to those in other industries. College graduates are preferred for jobs in advertising, personnel, accounting, and sales. For clerical and secretarial jobs, employers usually hire high school graduates who have training in areas such as stenography and typing.

Employment Outlook

Coal is expected to play an increasingly important role as a basic energy source. Rising demand for electric power coupled with greater emphasis on developing domestic energy supplies should result in accelerated coal production. The extent of growth in production, however, is uncertain. Oil, natural gas, and nuclear energy also are used to generate electricity, and the demand for coal will be determined, to some extent, by the price and availability of these fuels. Growth in production also depends on how quickly economical methods of coal gasification and liquification are developed. Environmental standards relating to strip mining and the use of high sulfur content coal, which causes air pollution, may also affect coal output. More coal however, will be needed to make steel, chemicals, and other products.

Employment is expected to increase but the amount of growth will depend on the level of production, on the types of mines opened, and the mining methods and machinery used. In addition to openings due to growth, several thousand openings will occur each year as experienced miners retire, die, or transfer to other fields of work.

Earnings and Working Conditions

In 1974, union wage rates for miners ranged from $5.34 to $7.59 an hour, with workers in underground mines generally earning slightly more than those in surface mines or preparation plants. In comparison, production workers in manufacturing averaged $4.49 an hour.

Because underground miners spend time traveling from the mine entrance to their working areas, they have a slightly longer day than surface miners. Those in surface occupations work a 7 1/4- hour shift (36 1/2- hour week), while underground miners work an 8-hour day (40-hour week).

Union miners receive 10 holidays and 14 days of paid vacation each year. As their length of service increases, they gain extra vacation days up to a total of 29. Union workers also receive benefits from a welfare and retirement fund, and workers suffering from pneumoconiosis (black lung) receive Federal aid.

Miners have unusual and harsh working conditions. Underground mines are damp, dark, noisy, and cold. At times, several inches of water may be on tunnel floors. Although mines have electric lights, many areas are illuminated only by the lights on the miners' caps. Workers in mines with very low roofs have to work on their hands and knees, backs, or stomachs in cramped areas.

Though safety conditions have improved considerably, miners must constantly be on guard for hazards. There is also the risk of developing pneumoconiosis from coal dust and silicosis from the rock dust generated by the drilling in the mines. Surface mines and preparation plants are usually less hazardous than underground mines.

Sources of Additional Information

For details about job opportunities in mining, contact individual coal companies. General information on mining occupations is available from:

United Mine Workers of America, 900 15th St. NW., Washington, D.C. 20005.

Bituminous Coal Operators' Association, 918 16th St. NW, Washington, D.C. 20006.

Mining Enforcement and Safety Administration, Department of Interior, Washington, D.C. 20240.

OCCUPATIONS IN PETROLEUM AND NATURAL GAS PRODUCTION AND GAS PROCESSING

Nature and Location of the Industry

Petroleum is a natural fuel formed from the decay of plants and animals. Buried beneath the ground for millions of years under tremendous pressure, this organic matter became petroleum, or what is usually called oil.

Oil and natural gas have assumed a position of such importance that they now furnish more than three-fourths of our energy needs. Oil and natural gas run our factories and transportation systems, heat our homes and places of work, and are basic raw materials for many products such as plastics, chemicals, medicines, fertilizers, and synthetic fibers.

In 1974, the Nation consumed 17 million barrels of oil a day—enough to fill a railroad train of tank cars that would stretch from Pittsburgh to St. Louis.

People with many different skills are needed to explore for oil and gas fields, drill new wells, improve existing wells, and process natural gas.

In 1974, about 290,000 workers were employed in these activities. Firms that work on contract for oil companies employed a large proportion of these workers, and the major oil companies employed the rest. Occupations in oil refining are discussed in a separate chapter elsewhere in the *Handbook*.

Since oil and gas are difficult to find, exploration and drilling are key activities in the petroleum industry. After scientific studies indicate the possible presence of oil, the company selects a well site and installs a towerlike steel rig to support the drilling equipment. A hole is bored deeper and deeper into the earth until oil or gas is found or the company decides to write the effort off as a loss. Although a few large oil companies do their own drilling, most is done by contractors. More than 7,000 firms are engaged in the search for and production of oil and natural gas.

When oil or gas is discovered, pipes, valves, tanks, and other equipment are installed to control the flow of these raw materials from the well. There were more than 600,000 wells in this country in 1974, and about half of all the petroleum industry's 200,000 production workers were needed to operate and maintain them.

Oil and gas are transported to refineries by pipeline, ship, railroad, barge, or truck. Many refineries are thousands of miles from oil fields, but gas processing plants usually are near the fields so that water, sulfur compounds, and other impurities can be removed before the liquid gases are piped to customers. These gases—chiefly ethane, propane, butane, and natural gasoline—are important raw materials for refineries and chemical plants. Some are widely used as heating fuels.

Although drilling for oil and gas is done in 32 States, about nine-tenths of the industry's workers are employed in 10 States. Texas leads in the number of oilfield jobs, followed by Louisiana, Oklahoma, California, New Mexico, Wyoming, Kansas, Colorado, Ohio, and Mississippi. Thousands of additional Americans are employed by oil companies overseas, mostly in the Middle East, Africa, Western Europe, South America, and Indonesia.

Occupations in the Industry

Workers with a wide range of education and skills are needed to find oil and gas and to drill, operate, and maintain wells and process natural gas.

Exploration. Exploring for oil is the first step in petroleum production. Small crews of specialized workers travel to remote areas to search for geological formations likely to contain oil. Exploration parties, led by a *petroleum geologist* (D.O.T. 024.081), study the surface and subsurface of the earth. Geologists seek clues to the possibility of oil traps by examining types of rock formations on and under the earth's surface. Besides making detailed ground surveys, petroleum geologists depend on aerial exploration and magnetic surveys for a broad picture of the area. Subsurface evidence is collected by boring and bringing up core samples of the rocks, clay, and sands that form the layers of the earth. From these examinations geologists draw cross-section maps of the underground formations to pinpoint areas where oil or gas may be located. In offshore exploration, they also may obtain rock samples from the bottom of the sea in their search for clues to oil-bearing formations. Many geologists work in district offices of oil companies or exploration firms where they prepare and study geological maps. They also study samples from test drilling to find any clues to oil.

In addition to the petroleum geologist, exploration parties may include other geology specialists: *Paleontologists* (D.O.T. 024.081) study fossil remains in the earth to locate oil-bearing layers of rock; *mineralogists* (D.O.T. 024.081)

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Seismic survey crew explores for oil and gas.

study physical and chemical properties of mineral and rock samples; *stratigraphers* (D.O.T. 024.081) determine the rock layers most likely to contain oil and natural gas; *photogeologists* (D.O.T. 024.081) examine and interpret aerial photographs of land surfaces; and *petrologists* (D.O.T. 024.081) investigate the history of the formation of the earth's crust. Exploration parties may also include *drafters* (D.O.T. 010.281) and *surveyors* (D.O.T. 018.188), who assist in surveying and mapping operations.

Most geophysical exploration is done by seismic prospecting. The seismograph is a sensitive instrument that records natural and man-made earthquakes. Artificial earthquakes in petroleum exploration are made by detonating explosives in the ground. The time it takes for sound waves to reach an underground rock layer and return indicates the depth of the layer. By setting off explosions at a number of locations, scientists can map underground formations with considerable accuracy, thus providing a clue to the whereabouts of traps that may contain oil.

A *geophysicist* (D.O.T. 024.081) usually leads a seismograph crew that may include: *prospecting computers* (D.O.T. 010.288), who perform the calculations and prepare maps from the information recorded by the seismograph; *observers* (D.O.T. 010.168) who operate and maintain electronic seismic equipment; *shothole drillers* (D.O.T. 930.782) and their *helpers* (D.O.T. 930.886), who operate portable drilling rigs to make holes into which explosives are placed; and *shooters* (D.O.T. 931.381) who place and detonate explosives.

Before exploration, the oil company must obtain permission to use the land. The *lease buyer* (D.O.T. 191.118) makes the necessary business arrangements with landowners or with owners of mineral rights.

Drilling. Exploration methods are used to find likely oil fields but only drilling can prove the presence of oil. Overall planning and supervision of drilling usually are the responsibilities of the petroleum engineer.

Wells are almost always started in the same way. *Rig builders* (D.O.T. 869.884) and a crew of *rig-builder helpers* (D.O.T. 869.887) install a portable drilling rig to support the machinery and equipment that raises and lowers the drilling tools. Rotary drilling is the normal way petroleum is brought to the surface. A revolving steel bit bores a hole in the ground by chipping and cutting rock. The bit is attached to a length of pipe which is turned by a diesel engine. As the bit cuts deeper into the earth, more pipe is added. Drilling pipe is hollow and runs the entire depth of the well. A stream of mud is continuously pumped into the hollow pipe and comes out through holes in the drill bit. This mud, a mixture of clay, chemicals, and water, cools the drill bit, plasters the walls of the hole to prevent cave-ins, and carries crushed rock to the surface so that drilling is continuous until the bit wears out. When a new bit is needed, all of the pipe must be pulled up out of the hole, a section at a time, a new bit placed on the end of the pipe, and the pipe returned to the hole.

The *tool pusher* or *drilling supervisor* (D.O.T. 930.130) supervises one or more drilling rigs and supplies materials and equipment to rig crews.

A typical rotary drilling crew consists of five workers: driller, derrick operator, engine operator, and two helpers. Because drilling rigs are operated 24 hours a day, 7 days a week, two to four crews are needed for each rig.

The *rotary driller* (D.O.T. 930.782) supervises the crew and operates machinery that controls drilling speed and pressure, and records operations. The rotary rig engine operator (D.O.T. 950.782) is in charge of engines that provide the power for drilling and hoisting. The *derrick operator* (D.O.T. 930.782), who is second in charge, works on a small platform high on the rig to help run pipe in and out of the well hole, and operates the pumps that circulate mud through the pipe. *Rotary drill helpers* (D.O.T. 930.844), also known as roughnecks, guide the lower end of the pipe to and from the well opening and connect and disconnect pipe joints and drill bits.

Roustabouts (D.O.T. 869.884) or general laborers, though not considered part of a drilling crew, do general oilfield maintenance and construction work, such as cleaning tanks and building roads.

Well Operation and Maintenance. When oil is found, the drill pipe and bit are pulled from the well, and metal pipe known as casing metal is lowered into the hole and cemented in place. The upper ends of the casing are fastened to a system of valves called a "Christmas tree." Pressure in the well forces crude oil and gas to the surface, through the Christmas tree, and into gas traps and storage tanks. If natural pressure is not great enough to force the oil to the surface, pumps are used.

Petroleum production engineers generally plan and supervise well operation and maintenance. To prevent waste, they decide the rate of oil flow and anticipate performance of oil reservoirs by analyzing information such as pressure readings from the well. Engineers are increasingly using computers for analytical work. Some engineers specialize in overcoming effects of corrosion on well casings, in the selection and design of production equipment and processes, or in the prevention of pollution. Some companies hire engineer aides to make tests, keep records, post maps, and otherwise assist engineers.

Pumpers (D.O.T. 914.782) and their helpers operate and maintain motors, pumps, and other equipment to force oil from wells. Their chief duty is to regulate the flow of oil according to a schedule set up by the petroleum engineer and production supervisor. Generally, a pumper operates a group of wells. *Switchers* work in fields where oil flows under natural pressure and does not require pumping. Pumpers open and close valves to regulate the oil flow from wells to tanks or into pipelines. *Gaugers* (D.O.T. 914.381) measure and record the flow and take samples to check quality. *Treaters* (D.O.T. 541.782) test the oil for water and sediment and remove these impurities by opening a drain at the tank's base or by using special chemical or electrical equipment. In some fields, pumping, switching, gauging, and treating operations are automatic.

Many skilled workers are employed in maintenance operations. Welders, pipefitters, electricians, and machinists repair and install pumps, gauges, pipes, and other equipment.

Natural Gas Processing. Most gas processing workers are operators. The *dehydration-plant operator* (D.O.T. 541.782) tends an automatically controlled treating unit which removes water and other impurities from natural gas. The *gasoline-plant operator* tends compressors that raise the pressure of the gas for transmission in the pipelines. The *gas-compressor operator* (D.O.T. 950.782) assists either of these two employees.

Many workers in the larger natural gas processing plants are employed in maintenance activities. These include instrument repairers, electricians, welders, and laborers.

In numerous smaller natural gas plants, workers combine skills, usually of operator and maintenance worker. Many small plants are so highly automated they are virtually unattended. They are checked at periodic intervals by maintenance workers or operators, or they are checked continuously by instruments which automatically report problems and shut down the plant if an emergency develops.

Other Oilfield Services. Companies that offer services on a contract basis provide another important source of employment. Among these employees are skilled workers such as *cementers* (D.O.T. 930.281), who mix and pump cement into the space between steel casings and well walls to prevent cave-ins; *acidizers* (D.O.T. 930.782), who force acid into the bottom of the well to increase the flow of oil; *perforator operators* (D.O.T. 931.782), who use subsurface "guns" to pierce holes in drill pipes or casings to make openings for oil to flow through; *sample-taker operators* (D.O.T. 931.781), who take samples of soil and rock formations from wells to help geologists determine the presence of oil; and *well pullers* (D.O.T. 930.883), who remove pipes, pumps, and other subsurface devices from wells for cleaning, repairing, or salvaging.

Offshore Operations. Most exploration, drilling, and producing activities are on land but an increasing amount of this work is done offshore, particularly in the Gulf of Mexico off the coasts of Louisiana and Texas. Some additional offshore work is being done in the Pacific Ocean off California, Oregon, Washington, and Alaska and in many foreign locations such as the Persian Gulf, Bass Strait, and

Drill crew lowers section of drill pipe on offshore rig.

North Sea. Some wells have been drilled over 100 miles from shore and in water more than 1,000 feet deep. These offshore operations require the same type of drilling crews as are employed on land operations. In addition, offshore operations require radio operators, cooks, ship's officers and sailors, and pilots for work on drilling platforms, crewboats, barges, and helicopters.

(Detailed discussions of professional, technical, mechanical, and other occupations found not only in the petroleum and natural gas production industry, but in other industries as well, are given elsewhere in the *Handbook* in the sections covering individual occupations.)

Training, Other Qualifications, and Advancement

Most workers in nonprofessional jobs with an exploration crew begin as helpers and advance into one of the specialized jobs. Their training may vary from several months to several years. New workers usually are hired in the field by the crew chief or by local company representatives. College students majoring in physical or earth sciences or in engineering may work part-time or summers with exploration crews, and get full-time jobs after graduation.

Members of drilling crews usually begin as roughnecks. As they acquire experience, they may advance to more skilled jobs. For example, a worker hired as a roughneck may advance to derrick operator and, after several years, become a driller. A driller can advance to the job of tool pusher in charge of one or more drilling crews.

Companies generally hire people who live near wells for well operation and maintenance jobs. They prefer applicants who have mechanical ability and a knowledge of oilfield processes. Because this type of work is less strenuous than drilling and offers the advantage of a fixed locale, members of drilling crews or exploration parties who prefer not to travel often transfer to well operation and maintenance jobs. New workers may start as roustabouts and advance to jobs as switchers, gaugers, or pumpers. Training usually is acquired on the job; at least 2 years of experience are needed to become an all-round pumper.

Post-high school vocational training in oilfield occupations is available from Eastern New Mexico University, Roswell, N.M.; Extension Services of the University of Texas; and the Petroleum Industry Training Service, Edmonton, Alberta, Canada. Most graduates of these programs find jobs readily available.

For scientists, such as geologists and geophysicists, college training with at least a bachelor's degree is required. The preferred educational qualification for a petroleum engineer is a degree in engineering with specialization in courses on the petroleum industry. However, college graduates having degrees in chemical, mining, civil or mechanical engineering, or in geology, geophysics, or other related sciences often are hired for petroleum engineering jobs. Petroleum engineering aides include people with 2-year technical degrees as well as former roustabouts or pumpers who have been promoted.

Scientists and engineers usually start at junior levels; after several years of experience they can advance to managerial or administrative jobs. Scientists and engineers who have research ability, particularly those with advanced degrees, may transfer to research or consulting work.

Information on training, qualifications, and advancement in natural gas processing plants is similar to that for petroleum refining. A statement on petroleum refining can be found elsewhere in the *Handbook*.

Employment Outlook

Employment in petroleum and natural gas production is expected to increase faster than the average for all industries through the mid-1980's. Besides the job openings created by employment growth, many openings will occur as workers retire, die, or leave the industry for other reasons.

Increased demand for crude oil and natural gas, higher prices for these products, and a national policy to move toward energy self-sufficiency are expected to provide the incentive for the industry to expand rapidly. Growth will be concentrated in exploration and drilling, and more workers will be needed in most occupations associated with these activities. Opportunities should be particularly good in offshore drilling.

Earnings and Working Conditions

In 1974, nonsupervisory employees in oil and gas extraction –

averaged $4.82 an hour. In comparison, the average for all nonsupervisory workers in private industry, except farming, was $4.22 an hour. Earnings usually are higher in offshore operations than in land operations.

Most oilfield jobs involve rugged outdoor work in all kinds of weather. They often are in remote areas in settings as varied as a Western desert, the Arctic Circle, or the Gulf of Mexico. Physical strength and stamina are important because the work involves standing most of the time, lifting moderately heavy objects, and climbing and stooping to work with power tools and handtools that often are oily and dirty.

Drilling employees may expect to move from place to place since their work in a particular field may be completed in less than a year. Exploration field personnel may be required to move even more frequently. They may be away from home for weeks or months at a time. Well operation and maintenance workers and natural gas processing workers usually remain in the same location for long periods.

On land, drilling crews usually work 7 days, 8 hours a day, and then have a few days off. In offshore operations, they may work 7 days, 12 hours a day, and then have 7 days off. If the well is far from the coast, they live on the drilling rig or on ships anchored nearby. Most workers in well operations and maintenance and natural gas processing work 8 hours a day, 5 days a week.

Sources of Additional Information

Further information about jobs in the petroleum industry may be available from the personnel offices of individual oil companies. For information on scientific and technical jobs, write to:

American Association of Petroleum Geologists, P.O. Box 979, Tulsa, Okla. 74101.

Society of Petroleum Engineers of AIME, 6200 N. Central Expressway, Dallas, Tex. 75206.

American Geological Institute, 2201 M St. NW., Washington, D.C. 20037.

CONSTRUCTION

The activities of the construction industry touch nearly every aspect of our daily lives. The houses and apartments in which we live; the factories, offices, and schools in which we work; and the roads on which we travel are examples of some of the products of this industry. The industry includes not only new construction, but also additions, alterations, and repairs to existing structures.

In 1974, about 4 million people worked in the contract construction industry. An additional 1.4 million workers are estimated to be either self-employed—mostly owners of small building firms—or are Federal, State, or local government employees who build and maintain our Nation's vast highway systems.

The contract construction industry is divided into three major segments. About half of the jobholders work for electrical, air-conditioning, plumbing, and other special trade contractors. Almost one-third work for the general building contractors that do most residential, commercial, and industrial construction. The remaining one-fifth build dams, bridges, roads, and similar heavy construction projects.

As illustrated in the accompanying tabulation, craft and kindred workers account for 55 percent of the total employment in this industry—a much higher proportion than in any other major industry. Some examples of craft workers are carpenters, painters, plumbers, and bricklayers. Laborers are the next largest occupational group and account for 15 percent of employment. They provide materials, scaffolding, and general assistance to skilled workers. Semiskilled workers (operatives), such as truckdrivers and welders, represent about 8 percent of the industry's work force. Managers and administrators—mostly self-employed—account for about 12 percent of employment. Clerical workers, largely typists, secretaries, and office machine operators, constitute another 7 percent of the industry's employment. Professional and technical workers, mostly engineers and engineering technicians, draftsters, and surveyors, make up the remaining 3 percent of the work force.

Major occupational group	*Estimated employment, 1974 (percent distribution)*
All occupational groups	100
Professional, technical, and kindred workers	3
Managers and administrators	11
Clerical and kindred workers	7
Salesworkers	(1)
Craft and kindred workers	55
Operatives	8
Service workers	(1)
Laborers	15

[1] Less than 0.5 percent.

NOTE: Due to rounding, sums of individual items may not add to total.

Construction industry employment is expected to rise faster than the average for all industries through the mid-1980's, as population and income growth create a demand for more houses, schools, factories and other buildings. Because of laborsaving improvements in tools, materials, and work methods, however, employment will not grow as rapidly as construction activity. Employment also may fluctuate from year to year because construction activity is sensitive to changes in economic conditions.

Contract construction is the major source of employment for skilled craft workers such as bricklayers, painters, and carpenters. For information on these and other construction crafts, see the chapter on Construction Occupations elsewhere in the *Handbook*. For information on occupations that are found in many other industries, see the index in the back of the book.

MANUFACTURING

Manufacturing is a key activity of our Nation's economy. The products of the manufacturing industries range in complexity from simple plastic toys to intricate electronic computers, and in size from miniature electronic components to gigantic aircraft carriers. Manufacturing involves many diverse processes. Workers process foods and chemicals, print books and newspapers, spin textiles and weave them, make clothing and shoes, and produce the thousands of other products needed for our personal and national welfare.

About 20 million people worked in manufacturing—the largest of the industry divisions—in 1974. About three-fifths of all manufacturing employees worked in plants that produced durable goods, such as steel, machinery, automobiles, and household appliances. The rest worked in plants that produced nondurable goods, such as processed food, clothing, and chemicals.

As illustrated in the accompanying table, blue-collar workers (craft workers, operatives, and laborers) make up about two-thirds of manufacturing employment. Operatives alone account for over four-tenths of the work force; many are spinners and weavers, sewing machine operators, machine tool operators and welders, or operators of the specialized processing equipment used in the food, chemical, paper, and petroleum industries.

Craft and kindred workers make up the next largest group and account for nearly one-fifth of employment in manufacturing. Many of these skilled workers install and maintain the wide assortment of machinery and equipment required in all factories. Others are employed in skilled production occupations. Machinists, for example, are especially important in the metalworking industries, as are skilled inspectors and assemblers. In the printing and publishing industries, compositors, typesetters, photoengravers, lithographers, and pressworkers make up a large share of the work force. The craft group also includes supervisors of blue-collar workers.

White-collar workers (professional, managerial, clerical, and salesworkers) account for nearly one-third of employment in manufacturing establishments. Clerical workers, such as secretaries and office machine operators, are the largest white-collar group. Clerical workers hold about 1 out of every 8 jobs in the manufacturing sector.

Professional, technical, and kindred workers account for about 1 out of every 10 jobs in manufacturing establishments. Engineers, scientists, and technicians represent a large share of the professional workers. These highly trained workers included not only those who oversee and guide the production processes, but also those who carry out the extensive research and development activities needed in the aerospace, electronics, chemical, petroleum, and other industries.

Major occupational group	*Estimated employment, 1974 (percent distribution)*
All occupational groups	100
Professional, technical, and kindred workers	9
Managers and administrators	7
Clerical and kindred workers	12
Salesworkers	2
Craft and kindred workers	19
Operatives	44
Service workers	2
Laborers	5

Population growth, rising personal income, and expanding business activity will create a substantial increase in the demand for manufactured products through the mid-1980's. Employment in manufacturing, however, is expected to increase at a slower pace than production. The application of modern technology to manufacturing processes will make possible substantial increases in production of goods without corresponding increases in the work force. Although the average rate of employment growth will be slow, employment trends of individual industries will vary widely. The industries manufacturing rubber and miscellaneous plastics products and medical and dental instruments employment should increase about one-third, far above the average increase. Employment in several other industries—including metalworking machinery, and computers and peripheral equipment—should increase faster than the average for all manufacturing. On the other hand, employment in some manufacturing industries—including tobacco, food, and radio and television sets—is expected to decline through the mid-1980's.

The statements that follow provide information on employment opportunities in several of the manufacturing industries. More detailed information about occupations that are found in manufacturing as well as in many other industries appears elsewhere in the *Handbook*. (See index in the back of the book.)

OCCUPATIONS IN AIRCRAFT, MISSILE, AND SPACECRAFT MANUFACTURING

Firms that manufacture and assemble aircraft, missiles, and spacecraft make up what is known as the "aerospace" industry. In 1974, more than three quarters of a million people worked in the industry: more than 500,000 in the manufacture and assembly of complete aircraft, aircraft engines, propellers, and auxiliary parts and equipment; 90,000, in the manufacture of missiles and spacecraft; and more than 160,000 in companies that make electronic equipment and instruments for aircraft, missiles, and spacecraft. Thousands of workers in other industries produced parts, machinery, and equipment used in the manufacture of aerospace vehicles. Also, thousands of Federal workers were engaged in aerospace-related work, since the Government is a major purchaser of the industry's products. These workers were primarily employed in the National Aeronautics and Space Administration (NASA) and the Department of Defense.

Aerospace jobs exist in almost every State. The largest concentration is in California. Other States with large numbers of aerospace jobs include New York, Washington, Connecticut, Texas, Florida, Ohio, Missouri, Pennsylvania, Massachusetts, Kansas, Alabama, Maryland, New Jersey, and Georgia.

Nature of the Industry

All aircraft, missiles, and spacecraft have the same basic components: a frame, an engine, and a guidance and control system. Missiles and spacecraft travel into space at speeds many times faster than sound, while aircraft fly in the earth's atmosphere at much slower rates. Missiles are powered by either jet or rocket engines; spacecraft are rocket-powered only. Aircraft are powered by piston, jet, or rocket engines.

Aircraft vary from small personal or business planes that do not cost much more than an automobile to multi-million dollar jumbo transports and supersonic fighters. In dollar value most aircraft production is for military use although the value of planes made for commercial and private use has been increasing.

Missiles are for military use and generally carry destructive warheads. While some are capable of traveling only a few miles, such as those that support ground troops and defend against low-flying aircraft, others have intercontinental ranges of 7,000 miles or more. Some missiles are launched from land; others from aircraft, submarines, or ships.

Most of the Nation's spacecraft are built for NASA and the Department of Defense to explore outer space or to monitor conditions within the earth's atmosphere. On manned flights, a cabin capsule carries the astronauts. Some spacecraft probe the space environment and then fall back to earth, while others enter into earth orbit and become artificial satellites. Still others orbit or land on the moon or go to other planets. All spacecraft carry instruments that record and transmit scientific data to earth stations.

Major aircraft, missile, and spacecraft firms contract with government or private business to produce an aerospace vehicle. As a contractor, the firm is responsible for managing and coordinating the entire project. This involves design, production, assembly, and inspection of the vehicle.

Although aircraft, missile, and spacecraft manufacturers generally make many components of a craft and do final assembly work themselves thousands of subcontractors are involved in the production of parts or supplies the original firm cannot produce, such as bearings, rocket fuels, or special lubricants. Other subcontractors produce subassemblies such as communication or guidance equipment, or jet engines. Some of these firms depend on still other subcontractors to supply parts for their subassemblies.

In producing an aerospace vehicle, the contractor's engineering department first prepares design drawings and specifications. Then, the production department works on details for machines, materials, and operations needed to manufacture the vehicle. Production includes designing and producing tools and fixtures to produce thousands of parts and accessories that make up an aerospace vehicle. Parts and components are inspected and tested many times before being assembled, and completed systems are examined for conformance to specifications. Before a finished vehicle is delivered, it is checked out by a team of mechanics, or flight-tested if it is an aircraft.

Occupations in the Industry

Because of the complex and changing nature of aerospace technology, firms need workers with many different types of skills. The types of workers required will also depend on the specific function of an aerospace plant. For example, a plant primarily engaged in research and development or in producing experimental prototypes requires many more scientists and engineers than a firm producing large quantities of parts for aircraft.

Major jobs in aerospace manufacturing are described under three main categories: professional and technical; administrative, clerical, and related occupations; and plant occupations. Many of these jobs are in other industries as well and are discussed in greater detail elsewhere in the *Handbook*.

Professional and Technical Occupations. Research and development (R&D) are vital to the aerospace industry. The pace of discovery in aerospace technology is so rapid, in fact, that much equipment becomes obsolete while still in an experimental stage or soon after being put into production. Today, research is conducted in many areas such as developing vehicles with greater speeds, ranges, and reliability; engines with more power; and more advanced sources of rocket propulsion such as nuclear and electric energy. Metals and plastics also are continually being developed for wider capabilities, as are electronic guidance and communication systems.

Emphasis on R&D makes the aerospace industry an important source of jobs for technical personnel. In 1974, about one-fourth of all employees were engineers, scientists, and technicians, a considerably higher proportion than in most other manufacturing industries.

Engineers, scientists, and technicians work together in developing

Engineer and technician run test on an aircraft design.

design for aircraft, missiles, and spacecraft. Before an engineering department approves a design for production, it conducts tests to determine which designs can best withstand expected operating conditions. A scale model is made from a preliminary drawing and is tested in wind, temperature, and shock tunnels and other testing areas that simulate actual flight conditions. Next, a full-sized experimental model, or prototype, is thoroughly tested in the air and on the ground. The design is modified many times during this process until the test results are satisfactory. Then, actual production may begin. Even after production has started, however, further changes are often made.

Due to the wide range of research and development projects, many types of engineers and scientists work in the aerospace industry. Aerospace, chemical, electrical, electronic, industrial, and mechanical, engineers are among the larger engineering branches needed in this industry. Scientists in the industry include physicists, mathematicians, chemists, metallurgists, and astronomers. These engineers and scientists work in a wide and varied range of applied fields such as materials and structures, energy and power systems, and space sciences.

Among the many types of workers assisting scientists and engineers are drafters and engineering and science technicians. Others include *production planners* (D.O.T. 012.188), who plan the layout of machinery, movement of materials, and sequence of operations for efficient manufacturing processes; and *technical illustrators* (D.O.T. 017.281), who help prepare manuals and other technical literature describing the operation and maintenance of aerospace products.

Administrative, Clerical, and Related Occupations. Managerial and administrative jobs generally are comparable to similar jobs in other industries, except that in the aerospace industry these positions are often filled by people with technical backgrounds in engineering or science. These positions include executives responsible for the direction and supervision of research and production, and officials in departments such as sales, purchasing, accounting, and industrial relations. Many thousands of clerks, secretaries, computer personnel, and other office personnel work in aerospace firms.

Plant Occupations. About one-half of all workers in the aerospace industry have plant- or production-related jobs. Plant jobs can be classified in the following groups: Sheet-metal work; machining and tool fabrication; other metal processing; assembly and installation; inspecting and testing; flight checkout; and materials handling, maintenance, and custodial.

Sheet-Metal Occupations. Following blueprints and other engineering information, *sheet-metal workers* (D.O.T. 804.281) shape complicated parts from sheets of thin metal by hand or machine. Hand methods include the shaping of

parts by pounding them with mallets and by bending, cutting, and punching them with handtools. Machine methods use power hammers and presses, saws, tube benders, and drill presses.

Less skilled workers usually specialize in the use of a single machine to fabricate parts required in large numbers. Some of these workers are *punch press operators* (D.O.T. 615.782), *power hammer operators* (D.O.T. 617.782) and *power shear operators* (D.O.T. 615.782 and .885).

Machining and Tool Fabrication Occupations. Machining and tool fabrication workers use a wide variety of machines and handtools to make metal parts of machines or other products. Many of these workers are in engine and propeller plants, which are basically metalworking establishments; fewer are required in plants that assemble complete aerospace vehicles.

The most skilled machinists are the *all-round machinists* (D.O.T. 600.280 and .281) who plan the work and set up and operate several types of machine tools. They perform highly varied, nonrepetitive machining operations, frequently producing parts for experimental and prototype vehicles.

Machine tool operators (D.O.T. 609.855) produce metal parts in large volume. They generally operate a single type of machine tool such as a lathe, drill press, or milling machine. Skilled operators set up work on a machine and handle more difficult and varied jobs. Less skilled operators do more repetitive work.

Other machining and tool fabrication workers produce parts needed for the manufacture of aerospace vehicles. On the basis of information received from an engineering department, *jig and fixture builders* (D.O.T. 693.280) build jigs—metal devices used as guides for tools. *Tool and die makers* (D.O.T. 601.280) make the cutting tools and fixtures used in machine tool operations, and the dies used in forging and punch press work.

Other Metal Processing Occupations. Some of the many other metalworking occupations are *tube benders* (D.O.T. 709.884), who form tubings used for oil, fuel, hydraulic, and electrical conduit lines; and *riveters* (D.O.T. 800.884) and *welders* (D.O.T. 810.782 and .884; 811.782 and .884; 812.884 and 813.380 and .885), who use mechanical and electrical devices to join fabricated parts. Metalworking jobs also are in foundry plants where workers produce castings by pouring molten metal into molds.

Many workers chemically treat and heat-treat aircraft, missile, and spacecraft parts during their manufacture to clean, change, or protect their surfaces or structural condition. For example, *heat treaters* (D.O.T. 504.782) heat sheet-metal parts to keep the metal soft and malleable for metal-shaping work. *Painters* (D.O.T. 845.781) and *platers* (D.O.T. 500.380) either paint or plate surfaces.

Assembly and Installation Occupations. Practically all plants in the aerospace industry employ assembly and installation workers. Some assemble engines, electronic equipment, and auxiliary components, but most assemble major subassemblies or install major components in aircraft or spacecraft. In an aircraft, for example, this work involves joining wings and tails to the fuselage and installing the engine and auxiliary equipment such as the fuel system and flight controls. Assemblers rivet, drill, bolt, and solder parts together.

Many assemblers are skilled mechanics and installers who read blueprints and interpret other engineering specifications as they take apart, inspect, and install complex mechanical and electronic assemblies. *Final assemblers* (D.O.T. 806.781) of complete aircraft and *missile or rocket assembly mechanics* (D.O.T. 625.281) do general assembly work, and often work on experimental, prototype, or special craft. Other skilled assemblers work in plants that produce relatively large numbers of aircraft and missiles rather than a few experimental types. They often specialize in the assembly of one specific part of a space vehicle. Assemblers also specialize in systems such as electrical wiring, heating, and plumbing.

Skilled assemblers work on intricate engine components.

Inspecting and Testing Occupations. Because aircraft, missiles, and spacecraft are extremely complex and affect the life and safety of people, firms employ workers to conduct thousands of painstaking inspections and tests. Inspectors thoroughly test each component and part as it moves through the production and assembly process, as well as just before delivery. Inspections are made not only by employees of the manufacturers but also by commercial firms that have contracted for the equipment. Employees of the Federal Government also inspect vehicles under government contract.

Most inspectors specialize in a

Production inspector checks out spacecraft.

certain area of aerospace manufacturing. Using complex machinery, they check to assure that all parts and assemblies were made according to engineering specifications. Among the most skilled inspectors, especially in final assembly plants, are *outside production inspectors* (D.O.T. 806.381) who examine machined parts, subassemblies, and tools and dies ordered from other firms. They also serve as a "link" between their own engineering department and supplying companies. *Machined parts inspectors* (D.O.T. 609.381) examine machined parts and fabricated sheet-metal and *assembly inspectors* (D.O.T. 806.381) inspect complete major assemblies and installations such as fuselage, wing, and nose sections to ensure their proper fitting. They also check the functioning of hydraulic, plumbing, and other systems. Less skilled inspectors check subassemblies.

Flight Checkout Occupations. Checking out every part of an aircraft or spacecraft before its first flight requires a team of mechanics. The *crew chief*, the most skilled mechanic of the team, directs other workers in the entire checking out operation. *Engine mechanics* specialize in checking out the powerplant of a craft, including the engine, propellers, and oil and fuel systems; and *electronics checkout* workers do the final operational examination of radio, radar, automatic pilot, fire control, and electronic guidance systems. The checking out process may require making minor repairs and, in some cases, even returning the craft to the plant for extensive adjustments.

Materials Handling, Maintenance, and Custodial Occupations. Aerospace plants employ many materials handlers such as truckdrivers, shipping clerks, and toolroom attendants. Maintenance workers, such as electricians, maintenance mechanics, carpenters, and plumbers, keep equipment and buildings in good operating condition and make changes in the layout of the plant. Guards, firefighters, and janitors provide protective and custodial services.

Training, Other Qualifications, and Advancement

A college degree in engineering or in one of the sciences usually is the minimum requirement for an entry level position as an engineer or scientist in the aerospace industry. Technicians can sometimes advance to these positions without a college degree, but only after years of work experience and some college-level training.

New entrants may qualify for technician positions by attending a technical institute or junior college, or by obtaining related work experience. Entry level plant occupations generally do not require a high school diploma although graduates are often preferred. Inexperienced plant workers generally start out in semiskilled positions and learn skills on the job and in classroom courses. As they gain experience, they can move on to more highly skilled positions. For example, it usually takes 2 to 4 years of plant experience to become a skilled assembler.

Skilled inspectors often have several years of machine shop experience and must be able to install and use various kinds of testing equipment and instruments, read blueprints and other specifications, and use shop mathematics.

Mechanics who do final checkout of aircraft and spacecraft may qualify for their jobs by working in earlier stages of the production line,

by receiving training in checkout work, or by working as 'line maintenance" mechanics with commercial airlines.

Chief mechanics usually need 3 to 5 years of experience in the manufacture of aircraft, missiles, and spacecraft, including at least 1 year as a checkout mechanic. Specialized mechanics, working under the supervision of a chief mechanic, usually need at least 2 years' experience. Less experienced helpers or assistants learn on the job, with plant training courses.

Apprenticeship programs are sometimes available for craft occupations such as machinists, tool and die makers, sheet-metal workers, aircraft mechanics, and electricians. The programs vary in length from 3 to 5 years depending on the trade. During this time, the apprentice handles work of progressively increasing difficulty as well as classroom instruction. Such instruction for a machinist apprentice, for example, includes courses in blueprint reading, mechanical drawing, shop mathematics, and physics.

Because complex and rapidly changing products require highly trained workers, aerospace plants sometimes support formal training to supplement day-to-day experience and help workers advance more rapidly. Although most are short-term programs to meet immediate needs, some major producers conduct training classes or pay tuition and related costs for outside courses. Some classes are held during working hours; others are after working hours.

Employment Outlook

Employment in the aerospace industry is expected to rise above recent levels by the mid-1980's. The number of people working in this industry, however, probably will remain below the peak levels of the late 1960's.

Thousands of jobs will open each year because of the growth expected in the industry, and to replace workers who retire, die, and transfer to jobs in other industries. Job opportunities are expected to increase for highly trained workers, such as scientists, engineers, and skilled plant personnel in all areas of the industry, especially with firms engaged in research and development and the manufacture of prototype and other technologically advanced aircraft. Less skilled and unskilled workers will also be needed to fill entry level plant positions.

Since many aerospace products are either military hardware or space vehicles, the industry's future depends, to a great extent, on the level of Federal expenditures. Changes in these expenditures usually have been accompanied by sharp fluctuations in aerospace employment. For example, aerospace employment declined sharply from the high levels of the late 1960's partly because of decreased aircraft requirements for Vietnam and reduced expenditures for space exploration. The outlook for this industry is based on the assumption that defense spending will increase moderately from the 1974 level, but will be slightly below the peak levels of the late 1960's. R&D spending is also expected to be above current levels. If actual expenditures should differ substantially from these assumed levels, the outlook will be affected accordingly.

Civilian aircraft production also is an important determinant of aerospace employment. Overall employment in this area is expected to remain fairly stable through the mid-1980's. Nevertheless, thousands of new workers will be required in this sector of the industry to replace those who die, retire or transfer to other fields.

Earnings and Working Conditions

Plant workers' earnings in the aerospace industry are higher than those in most other manufacturing industries. In 1974, for example, production workers in plants making aircraft and parts averaged $5.40 an hour; production workers in all manufacturing industries as a whole averaged about $4.22 an hour.

The following tabulation indicates an approximate range of hourly wages for selected occupations in 1974 obtained from the collective bargaining agreements of a number of major aerospace companies; these rates do not include incentive earnings. The ranges in various jobs are wide, partly because wages within an occupation vary according to workers' skills and experience, and partly because wages differ from plant to plant, depending upon type of plant, locality, and other factors.

Aircraft mechanics	$4.00–6.88
Assemblers	4.28–5.51
Electronics technicians	4.50–6.00
Heat treaters	5.53–6.33
Inspectors and testers	4.38–6.63
Jig and fixture builders	5.06–5.98
Machinists	4.32–6.97
Maintenance crafts	4.32–6.97
Riveters	3.50–4.63
Tool and die makers	5.78–6.88
Welders	3.50–6.97

Fringe benefits in the industry usually include 2 weeks of paid vacation after 1 or 2 years of service, and 3 weeks after 10 to 12 years. Employees generally get 8 to 12 paid holidays a year and 1 week of paid sick leave. Other major benefits include life insurance; medical, surgical, dental, and hospital insurance; accident and sickness insurance; and retirement pensions.

Most employees work in modern factory buildings that are clean, well-lit, and well-ventilated. Some work outdoors. Operations such as sheet-metal processing, riveting, and welding may be noisy, and some assemblers may work in cramped quarters. Aerospace plants, however, are relatively safe.

Most plant workers in the aerospace field are union members. They are represented by several unions including the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America; and the International Union of Electrical, Radio, and Machine Workers. Some craft workers, guards, and truckdrivers are members of unions that represent their specific occupational groups.

Sources of Additional Information

Additional information about careers in the aerospace field is available from:

National Aeronautics and Space Administration, Washington, D.C. 20546.

Electronics Industries Association, 2001 Eye St. NW., Washington, D.C. 20006.

For specific information about an occupation, contact:

International Union, United Automobile, Aerospace, and Agricultural Implement Workers of America, 8000 East Jefferson Ave., Detroit, Mich. 48214.

International Union of Electrical, Radio and Machine Workers, AFL-CIO, 1126 16th St. NW., Washington, D.C. 20036.

OCCUPATIONS IN THE ALUMINUM INDUSTRY

Aluminum was once considered a specialty metal having limited applications. Today it is produced in quantities second only to iron and steel. It is used in products that range from household appliances and cooking utensils to automobiles, aircraft, and missiles. In recent years, many new uses for aluminum have been developed, including house siding, containers, and electrical cables. In 1974, the industry produced about 12.0 billion pounds of primary aluminum, or about twice the output of only 10 years earlier.

This statement describes occupations in plants that produce ingots (bars) of primary aluminum. It also describes occupations in plants that shape the ingots into sheets, wire, and other forms by rolling, stretching, or forcing the aluminum through an opening. Occupations concerned with casting, forging, stamping, machining, and fabricating aluminum are discussed separately in the *Handbook* statements dealing with forge shop, foundry, and metalworking occupations.

About 105,000 persons worked in the aluminum industry in 1974. Approximately one-third helped make aluminum; the remainder helped convert large pieces into sheets, cables, and other industrial products.

Since the huge machinery necessary for making aluminum is very expensive, the production of primary aluminum is concentrated in a relatively small number of plants. These plants generally are located near abundant sources of alumina and electricity. Many are in Arkansas, Louisiana, Texas, Alabama, and Tennessee, where alumina is made from bauxite ore imported from the Caribbean area or mined locally and electricity is obtained from the Tennessee Valley Authority or generated from local deposits of natural gas or oil. About two-fifths of the employees who make aluminum work in these States. Another one-fifth work in the State of Washington where plants are located to serve customers on the West Coast. A significant number of employees also work in plants located in Ohio, Indiana, and New York.

Plants that shape aluminum into sheets, wire, and other products are more dispersed geographically. Over one-half of the employment in these plants is in California, Pennsylvania, Tennessee, Illinois, Alabama, New York, and Ohio. The remainder is widely scattered throughout a large number of States.

Occupations in the Industry

Employment in the aluminum industry falls into several categories. The biggest group—about three-fourths—are the production workers directly involved in operating or maintaining the industry's production equipment. The remaining one-fourth are in professional, technical, administrative, clerical, and supervisory positions.

Production Occupations. To illustrate the production occupations found in the industry, a description of the major steps in making and shaping aluminum follows.

Making Aluminum. Aluminum is obtained from alumina by using electricity to create chemical changes that separate pure aluminum from other materials. Alumina—a fine, white powder processed from bauxite ore—is placed in large containers called "pots" that are filled with a special liquid. Suspended in the liquid are poles (anodes); electric cables are attached to the pots and to poles. When the process is in operation, electricity flows from the poles, through the liquid containing the alumina, and to the walls and floors of the pots. As the electricity passes through the liquid, it heats and chemically changes the alumina to pure, liquid aluminum. Because the aluminum is heavier, it settles to the bottom of the pot; waste materials go to the top of the liquid. Periodically, pure aluminum is removed from the bottom of the pot.

Pot tenders (D.O.T. 512.885) see that the pots operate continuously. Each is responsible for a number of pots. As a result of the chemical changes, the alumina in each pot is slowly used up. By watching the surface of the liquid, or instruments, tenders determine when to add alumina from the overhead storage compartment.

Processing worker loads shredder with old aluminum cans that are to be recycled.

Every 24 to 72 hours, molten aluminum is siphoned from the bottom of the pots into huge brick-lined, steel containers or "crucibles." The *tapper* (D.O.T. 514.884) and *tapper helper* (D.O.T. 514.887) signal the *hot-metal crane operator* (D.O.T. 921.883) to place the overhead crane near the pot. Using automatic equipment, they break a hole in the crust of waste materials that forms on the top of the liquid. One end of a curved, cast iron tube is inserted into the pot; the other end is placed into a crucible and the molten metal is drawn from the pot into the crucible.

After aluminum has been taken from several pots and the crucible is full, *charge gang weighers* (D.O.T. 502.887) weigh and sample the molten metal for laboratory analysis. Then, workers operating overhead cranes pour the molten metal from the crucible into a remelting furnace. A *remelt operator* (D.O.T. 512.885) adds portions of aluminum scrap, other molten metal, or chemicals that will produce metal with the desired properties. Finally, hand skimmers remove waste products which have been forced to the surface of the molten metal.

After operating for a number of months, the heat and chemical reactions make holes in the pot's lining so that the liquid metal contacts the steel container. When this happens, the pot is shut down and the liquid drained so that *pot liners* (D.O.T. 519.884) can make repairs. Depending on the condition of the pots, liners may patch holes in the lining or may completely remove and replace the lining.

The metal is then transferred to the second or holding compartment of the furnace until a sufficient supply is obtained for pouring. The *d.c. casting operator* (D.O.T. 514.782) has charge of the pouring station where the molten metal is cast into ingots—large blocks of metal. The operator controls the cooling conditions of the casting unit by keeping the molds full of metal and spraying water against the molds to produce ingots of uniform size and quality.

Shaping aluminum. The large ingots must be reduced in size before the aluminum is useful to customers. Depending on the final product desired, several methods may be used to shape the ingot. Aluminum products such as plate, sheet, and strip are produced by rolling.

The first step in rolling is to remove surface impurities from the ingot. The *scalper operator* (D.O.T. 605.782) manipulates levers of a scalper machine and cuts thin layers of rough metal from the ingots so that the surfaces are smooth. Then, the ingots are heated to proper working temperatures for rolling. Workers operating overhead cranes lower the ingots into furnaces, or "soaking pits," where they are kept sealed for 12 to 18 hours. *Soaking pit operators* (D.O.T. 613.782) manage the furnace and control the temperature and heating time.

After being heated, the huge ingots are positioned on the "breakdown" or hot rolling mill where they are converted into elongated slabs. *Rolling mill operators* (D.O.T. 613.782) manipulate the ingots back and forth between powerful rollers until they are reduced in thickness to about 3 inches. The slabs then move down the line on the rollers to additional hot mills that work them down to a thickness of about one-eighth of an inch. At the end of the hotline, a *coiler operator* (D.O.T. 613.885) tends a coiler that automatically winds the metal onto reels.

Worker polishes aluminum wing section for airliner.

The coiled aluminum cools at room temperature before being cold-rolled still thinner. Cold-rolling produces a better surface finish and increases the metal's strength and hardness. Since continuous cold-rolling could make the metal too brittle, an *annealer* (D.O.T. 504.782) occasionally heats (anneals) the metal.

As an alternative to being rolled, the metal now may be stretched. *Stretcher-level-operators* (D.O.T. 619.782) and *stretcher-level-operator helpers* (D.O.T. 619.886) position the finished plate or sheet in clamps, determine the stretch required to remove surface contours, and operate the machine that pulls the metal from end to end to stretch it.

In the rod and bar factory, square castings called "billets" are heated to make them softer and then are rolled through progressively smaller openings, until the desired size is obtained. To produce wire, hot-rolling continues until the rod is about three-eighths of an inch in diameter. Then, *wire draw operators* (D.O.T. 614.782) operate machines that pull the cold wire through a series of holes (dies) that gradually reduce its size. The machines also automatically coil the wire on revolving reels.

Structural products such as I-beams and angles may be hot-rolled or extruded. Hot-rolled products are made by passing a square billet with rounded corners between grooved rolls that gradually reduce the thickness and change the shape of the metal.

Extruding of metal often is compared with squeezing toothpaste from a tube. Extruded aluminum shapes are produced by placing hot

billets (bars) inside a cylinder in a powerful press. A hydraulic ram that usually has a force of several million pounds pushes the metal through a hole (die) at the other end of the cylinder. The metal takes the shape of the die and then may be cut into desired lengths. By designing different dies, almost any shape of aluminum product may be formed. *Extrusion press operators* (D.O.T. 614.782) regulate the rate at which the metal is forced through the press.

During both the production and shaping processes, workers and machines inspect the metal to assure quality. *Radiographers* (D.O.T. 199.381) operate various types of X-ray equipment to inspect the metal. Computers monitor operations and automatically adjust metal temperature and mill speed.

Other production workers in the aluminum industry keep machines and equipment operating properly. Some move materials, supplies, and finished products throughout the plants; still others are in service occupations such as guard and custodian. Many of these occupations are common to other industries. (See index to the *Handbook*.)

Since electricity is vital to making aluminum, the industry needs many electricians to install and repair electrical fixtures, apparatus, and control equipment. Other employees, such as millwrights and maintenance machinists, make and repair mechanical parts for plant machinery, while stationary engineers operate and maintain the powerplants, turbines, steam engines, and motors used in aluminum plants.

Other important groups are the diemakers who assemble and repair dies used in aluminum metalworking operations; the bricklayers who build and reline furnaces, soaking pits, and similar installations; and the welders who join metal parts together with gas or electric welding equipment. In addition, plumbers and pipefitters lay out, install, and maintain piping and piping systems for steam, water, and other materials used in aluminum manufacturing.

Professional, Technical, Administrative, Clerical, and Sales Occupations. About one employee in ten is a professional or technical worker; about the same proportion are clerks. The few remaining workers are in administrative and sales positions.

Companies employ a variety of professional specialists in producing aluminum. Quality control chemists analyze the aluminum and the raw materials used in its production while process metallurgists determine the most efficient methods of producing aluminum from raw materials. Physical metallurgists test aluminum and aluminum alloys to determine their physical characteristics and also develop new alloys and new uses for aluminum.

Chemical engineers and mechanical engineers design and supervise the construction and operation of production facilities. Mechanical engineers may design new rolling mills or improve existing mills and related equipment. Electrical engineers plan and oversee the installation, operation, and maintenance of the electric generators and distribution systems used in the manufacture of aluminum. Industrial engineers conduct work measurement studies and develop management control systems to aid in financial planning and cost analysis.

Engineering technicians, laboratory technicians, and chemical analysts assist engineers and chemists in research and development work. Drafters prepare the working drawings that are required to make or repair production machinery.

A wide range of other profesional and administrative workers is needed in the manufacture of aluminum. Top executives manage the companies and determine policy. Middle managers and superintendents direct individual departments, offices, and production operations. The industry also employs other adminstrative personnel, as well as accountants, lawyers, statisticians, economists, and mathematicians. Clerical workers, including bookkeepers, secretaries, stenographers, clerk typists, and keypunch and computer operators keep company records and do other routine office work.

Training, Other Qualifications, and Advancement

Aluminum companies generally hire and train inexperienced workers for processing and maintenance jobs. A bachelor's degree is required for most professional jobs, and graduate degrees in science or engineering are preferred for research and development work. Administrative and managerial positions usually are filled by workers who have engineering or science backgrounds and have been promoted to these jobs. Some new graduates who have degrees in business administration or liberal arts may fill entry level administrative jobs. Sales positions often are filled by persons with technical backgrounds.

Applicants and current employees who demonstrate an aptitude for technical work have opportunities to qualify as technicians, laboratory assistants, and other semiprofessional workers. However, some college background in engineering and science, or graduation from a technical institute or community college, is required for many technical jobs.

Unskilled workers begin their careers in a labor pool and sub-

stitute for absent workers until they become eligible for permanent positions in a shop or department. As these workers acquire additional skills and seniority with the company, they usually move to more responsible and better paying positions. Some eventually become supervisors.

Craft workers usually are trained on the job. A number of companies, particularly the larger ones, have craft apprenticeship programs that include classroom or home study courses, as well as on-the-job training. Generally, candidates for these programs are chosen from promising young workers already employed by the company. The length of the apprenticeship varies according to the craft, although most require 3 to 4 years. Examples of crafts that can be learned through apprenticeship are: electrician, welder, brickmason, carpenter, machinist, maintenance mechanic, pipefitter, and general maintenance mechanic.

Employment Outlook

Employment in the aluminum industry is expected to grow about as fast as the average for all industries through the mid-1980's. In addition to growth, many job opportunities will arise from the need to replace workers who retire, die, or leave the industry for other reasons. The number of job opportunities may vary from year to year, however, because the demand for aluminum fluctuates with ups and downs in the economy.

Over the long run, demand for aluminum is expected to grow as population increases and consumers have more money to spend on products made from aluminum. Industries that represent major markets for aluminum are growing industries with potential for new product development. For example, aluminum is being used widely in the construction of large buildings and for residential construction and remodeling. Furthermore, the aluminum industry supports a strong research and development program and an aggressive marketing program which should continue to develop new alloys, processes, and products. As a result, the number of engineers, scientists, and technical personnel is expected to increase as a proportion of total employment. On the other hand, technological developments, such as computer-controlled rolling operations, will limit employment growth among some production occupations.

Earnings and Working Conditions

Hourly earnings of plantworkers in the aluminum industry are higher than the average for manufacturing industries. In 1974, production workers in plants which make aluminum averaged $6.06 an hour, and those in aluminum rolling and drawing plants averaged $5.28. In comparison, production workers in manufacturing industries as a whole averaged $4.40 an hour.

Skilled operators and skilled maintenance and craft workers hold the highest paying plant jobs. Hourly rates in 1974 for selected occupations in a number of plants covered by one major union-management contract are shown below.

Occupation	*Hourly wage rate*
Making Aluminum:	
Anode rebuilder	$5.12
Pot liner	5.44
Pot tender	5.36
Tapper	5.60
Charge gang weigher	5.12
Shaping Aluminum:	
Scalper operator	5.60
Soaking pit operator	5.20
Hot mill operator, junior	5.52
Continuous mill operator	6.16
Annealer	5.20
Sheet stretcher-leveler operator	5.12
Inspector	5.28
Extrusion press operator	5.68
Maintenance:	
Boiler firer	5.28
Bricklayer	6.08
Welder	5.52
Pipefitter	6.00
Millwright	6.00
Electrician	6.24
Machinist	6.24

Aluminum workers receive many fringe benefits, such as paid vacations and holidays, retirement benefits, life and health insurance, shift differentials, supplemental jury-duty pay, and supplemental unemployment benefits. Most workers receive paid vacations ranging from 1 to 4 weeks, depending on length of service. In addition, there are extended vacation plans that provide a 10-week vacation every 5 years.

Making aluminum requires high temperatures; the potroom is often hot, dusty, and smoky. However, working conditions in plants have been improved as a result of smoke control programs and other projects. Because making aluminum is a continuous process, some production employees have to work nights and weekends.

The shaping sector of the industry offers more favorable work conditions though workers in certain jobs are subject to heat, noise, and other discomforts.

The industry stresses safe working conditions and conducts safety education programs. Plants where aluminum is made have had a lower rate of injuries than the average for all metal industries, while the rate for aluminum rolling and drawing mills has been about the same as the average. However, the average number of workdays lost for each injury in the aluminum industry has been greater than the average for metal industries.

Most process and maintenance

workers in the aluminum industry belong to labor unions. In addition, labor organizations represent some office and technical personnel. The unions having the greatest number of members in the industry are United Steelworkers of America; Aluminum Workers International Union; and International Union, United Automobile, Aerospace and Agricultural Implement Workers of America.

Sources of Additional Information

Information on aluminum production and uses, as well as careers, many be obtained from:

The Aluminum Association, 750 Third Ave., New York, N.Y. 10017.

OCCUPATIONS IN THE APPAREL INDUSTRY

The apparel industry is an important source of jobs for workers who have widely different skills and interests. Many of these jobs can be learned in a few weeks; others take several years.

Nature and Location of the Industry

Over 1.3 million people were employed in the apparel industry in 1974. Approximately 585,000 produced women's and children's apparel and about 495,000, men's. The rest made such items as fur goods, gloves, hats, curtains, and draperies.

Although apparel factories are located in nearly all States, about 80 percent of the workers are employed in 15 States: New York, Pennsylvania, California, North Carolina, New Jersey, Georgia, Texas, Tennessee, Massachusetts, South Carolina, Alabama, Mississippi, Virginia, Missouri, and Illinois. New York and Pennsylvania alone employ approximately 30 percent of the industry work force.

Some of the important Northeastern apparel manufacturing centers are in New York City, suburban New Jersey, Boston, Philadelphia, and in smaller cities in Pennsylvania such as Wilkes-Barre, Hazelton, and Allentown. Leading Midwestern and Western centers include Chicago, St. Louis, Dallas, El Paso, San Antonio, and Los Angeles. Apparel manufacturing in the Southeast tends to be widely dispersed. North Carolina, for example, has plants in about 80 of its 101 counties.

Most apparel plants are small. Only about 1 out of every 7 employs more than 100 workers. Plants that manufacture standard garments such as work pants usually are larger than those making expensive dresses and other items that are subject to rapid style change.

Occupations in the Industry

The major operations in making apparel are designing and pattern making, cutting and marking, sewing, and pressing. Generally, high grade and style-oriented apparel is more carefully designed and involves more handwork than cheaper, more standardized items. For example, much hand detailing goes into a fashionable cocktail dress or a high-priced suit or coat, while items such as undershirts and overalls usually are sewn entirely by machine. To make the many different kinds of garments, workers with various skills and educational backgrounds are needed.

Designing Room Occupations. Typically, the manufacturing process begins with the *designer* (D.O.T. 142.081), who creates new types and styles of apparel. Inspiration for a new design may come from any of a variety of experiences: traveling, observing life styles, and seeing the work of other designers, to name but a few. In addition to creativity, designers must have practical knowledge of the apparel business so that they can translate their ideas into styles that can be produced at competitive prices. They must, for example, be familiar with labor costs for various factory operations such as cutting, sewing, and pressing.

A large manufacturer generally has a head designer and several assistants. Many small firms, however, do not employ designers but purchase ready-made designs or patterns or copy higher priced designs.

A designer usually works with one type of apparel, such as suits or dresses, although some work with several. For a high-quality dress, designers usually start by drawing sketches and choosing fabrics, trim, and colors. Using these sketches as guides, designers and their assistants make an experimental dress. They cut materials and pin, sew, and adjust the dress on a form or a live model until it matches the sketch.

Sample makers (D.O.T. 785.381) use this experimental dress as a guide in cutting and sewing fabrics to make a finished sample of the dress. After management has approved the sample, a *pattern maker* (D.O.T. 781.381) constructs a master pattern. Working closely with the designer, the pattern maker translates the sketch or sample dress into paper or fiberboard pieces, each one representing a part of the garment. A *pattern grader* (D.O.T. 781.381) measures the pieces that make up this master pattern, and modifies them to fit various sizes. Some large plants use computers to reduce the time needed to draw up the patterns for each size.

Styles for many items, such as men's suits and jackets, do not change significantly from year to year; thus, some of the steps described above are not required. A designer may alter the style of a suit, for example, by simply making minor changes on the master pattern. Before making such changes, however, the designer must be able to sketch or mentally picture how the total appearance of the suit will be affected.

Cutter guides electric knife through layers of cloth.

Cutting Room Occupations. Workers in the cutting room prepare cloth for sewing. There are five basic operations in the cutting department: spreading, marking, cutting, assembling, and ticketing. Small shops may combine two or more of these operations into a single job.

Hand spreaders (D.O.T. 781.887) lay out bolts of cloth into exact lengths on the cutting table. *Machine spreaders* (D.O.T. 781.884) are aided by machines in laying the cloth evenly across the table.

Markers (D.O.T. 781.484) trace the fiberboard pattern pieces on large sheets of paper, and may make several carbons of these tracings. In some cases they trace the pattern pieces with chalk directly on the cloth itself, rather than on paper. To get the greatest number of garments from a minimum quantity of cloth, markers arrange pattern pieces so that there is just enough distance between them for the cutter to work.

A *cutter* (D.O.T. 781.884) cuts out the various garment pieces from layers of cloth. Sometimes these layers are as high as 9 inches. The cutter follows the outline of the pattern on the cloth with an electrically powered knife which slices through all the layers at once. The work of a cutter and a marker frequently is combined into a single job.

The pieces of cloth that have been cut are prepared for the sewing room by another group of specialized workers. *Assemblers*, sometimes called *bundlers* or *fitters* (D.O.T. 781.687), bring together and bundle the pieces and accessories (linings, tapes, and trimmings) needed to make a complete garment. They match color, size, and fabric design and use chalk or thread to mark locations for pockets, buttonholes, buttons, and other trimmings. They identify each bundle with a ticket, which is also used to figure the earnings of workers who are paid according to the number of pieces they produce. The bundles are then routed to the various sections of the sewing room.

Sewing Room Occupations. About one-half of all apparel workers are handsewers and sewing machine operators. Expensive garments and finishing touches on moderate-priced clothing may need much hand sewing. Most sewing, however, is done with machines.

Sewing machine operators (D.O.T. 787.782) use industrial machines that are heavier and run faster than the ones found in the home. These workers generally specialize in a single operation such as sewing shoulder seams, attaching cuffs to sleeves, or hemming blouses. Some make sections such as pockets, collars, or sleeves; others assemble and join these completed sections to the main parts of the garment.

Sewing machine operators generally are classified by the type of machine they use, such as single-needle sewing machine operator or blind-stitch machine operator, and by the type of work performed, such as collar stitcher or sleeve finisher.

Most hand sewing is done on better quality or highly styled dresses, suits, and coats. *Hand sewers* (D.O.T. 782.884) use needle and thread to perform various operations ranging from simple sewing to complex stitching. Many hand sewers specialize in a single operation, such as lapel basting or lining stitching.

Instead of being sewn, parts such as collars and lapels may be "fused" together by heat and pressure. A *fusing machine operator* places the garment part on a loading platform of a fusing press which is adjusted to apply the precise amount of pressure and temperature needed for a permanent bond.

In a typical apparel plant, bundles of cut garment pieces move through the sewing department, where the garments take form as they pass through a series of sewing operations. Each operator performs one or two assigned tasks on each piece in the bundle and then passes the bundle to the next operator. Many plants employ *material handlers* (D.O.T. 929.887) who move garment bundles from one sewing operation to another.

At various stages of the sewing operations, *inspectors* and *checkers*

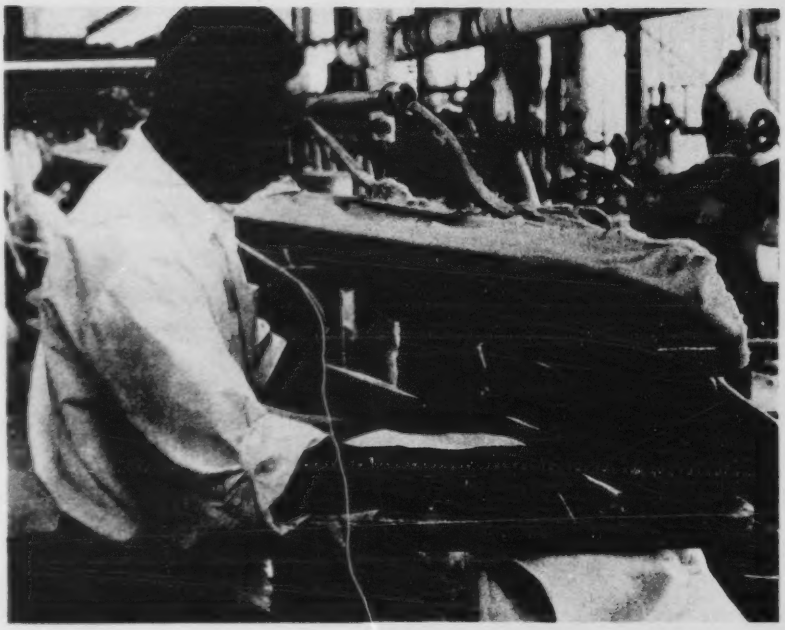
(D.O.T. 789.687) examine garments. They mark defects, such as skipped stitches or bad seams, which are repaired before the garments are passed on to the next sewing operation. Inspectors sometimes make minor repairs. *Trimmers, hand* (D.O.T. 781.887), often called thread trimmers and cleaners, remove loose threads, basting stitches, and lint from garments. This is called "in-process inspection."

Tailoring Occupations. Tailors (D.O.T. 785.261 and .381) and dressmakers (D.O.T. 785.361) are skilled workers who do difficult kinds of hand and machine sewing. Most of them are employed in making expensive clothing that needs precise shaping and finishing. Although some tailors and dressmakers make complete garments, most specialize in a few operations such as collar setting and lapel padding.

Bushelers (D.O.T. 785.281) are tailors who repair defects in finished garments rejected by the inspector. They alter parts that have not been sewn correctly, rearrange padding in coats and suits, and do other sewing necessary to correct defects.

Pressing Occupations. The shape and appearance of the finished garments depend, to a large extent, on the pressing that is done during and after sewing operations.

Pressers (D.O.T. 363.782, .884, and .885) use various types of steam pressing machines, and may work with manikins and body forms, or use hand irons to flatten seams and to shape parts and finished garments. There are two basic types of pressers—underpressers and finish pressers. Underpressers specialize on particular garment parts, such as collars, shoulders, seams, or pockets. Their duties vary from simple smoothing of cloth and flattening of seams to skillful shaping of garment parts.



Appearance of the finished garment depends largely on the presser's skills.

Finish pressers generally do final pressing and ironing at the end of the sewing operations.

Fur Shop Occupations. Because furs are expensive and difficult to work with, making a fur garment requires workers who have special skills not found in plants that make other types of apparel.

The most skilled worker in a fur garment plant is the *fur cutter* (D.O.T. 783.781), who also may be the supervisor. The cutter selects and matches enough fur skins to make a single garment, such as a coat or jacket, and arranges and cuts the skins on pattern pieces so that the choice sections of fur are placed where they will show. Following the sewing instructions given by the cutter, *fur machine operators* (D.O.T. 787.782) sew these pelts together to make garment sections. A *fur nailer* (D.O.T. 783.884) wets the sewn garment sections, stretches them by hand, and either staples or nails them on a board so that they will cover the pattern. When the sections are dry, this worker removes the staples or nails and trims the fur exactly along the outline of the pattern. The fur machine operator then finishes sewing the various sections to complete the garment. *Fur finishers* (D.O.T. 783.381) sew in the lining, tape edges, make pockets, and sew on buttons and loops.

Administrative, Sales, and Maintenance Occupations. Most administrative positions in an apparel plant are in the production department. Production managers are responsible for estimating production costs, scheduling the flow of work, hiring and training workers, controlling quality, and supervising the overall production activities of the plant. In some small apparel firms, the production manager also is a designer.

Industrial engineers advise management about the efficient use of machines, materials, and workers. (Further discussion of industrial engineers is included elsewhere in the *Handbook*.)

Clerks, bookkeepers, stenog-

A large proportion of apparel industry employees are sewing machine operators.

raphers, and other office workers make up payrolls, prepare invoices, keep records, and attend to other paperwork. In some large plants, many clerical functions are handled with computers. This requires keypunch operators, computer programmers and operators, and systems analysts. Salesworkers, fabric buyers, models, accountants, and sewing machine mechanics and technicians are among other types of workers in the apparel industry. Discussions of many of these jobs can be found elsewhere in the *Handbook*.

Training, Other Qualifications, and Advancement

Most production (plant) workers in the apparel industry pick up their skills on the job by helping and observing experienced workers. Training time ranges from a few weeks to several years, depending on the type of occupation, the worker's aptitude, and the employer's training programs. A relatively small number of employees are trained in formal apprenticeship programs for highly skilled occupations, such as pattern maker, cutter, and tailor. Apprenticeships include both classroom and on-the-job training. Some private and public schools in apparel manufacturing centers offer courses in pattern making, cutting, and tailoring, as well as machine and hand sewing. Students who complete these courses, however, usually need additional on-the-job training.

Many production occupations are well suited for the handicapped because the work is done while the worker is seated. In many cases, little physical effort is required. Good eyesight and manual dexterity, however, are vital.

Entry into beginning hand or machine-sewing jobs is relatively easy, since there are few restrictions regarding education and physical condition. New workers start by sewing straight seams, under the supervision of a skilled worker or supervisor, and progress to more complicated sewing as they gain experience. Many large companies have special on-the-job training programs for sewing machine operators. The operator is taught how to perform each operation with minimal finger, arm, and body movement. The ability to do routine work rapidly is essential, since nearly all sewers are paid by the number of pieces they produce. Some sewers advance to other jobs in the plant, such as tailor or dressmaker; others become supervisors. Most sewers, however, stay on the same general operation throughout their working lives and can look forward only to moving from simple sewing tasks to more complicated ones that pay higher piece rates.

New workers usually enter the cutting room by taking jobs as assemblers (bundlers or fitters). Patience and the ability to match colors are necessary for these jobs. An assembler may be promoted to spreader, and after a few years, to marker or cutter.

Pattern graders usually are selected from employees working in the cutting room or in other plant jobs. Training in drafting is helpful since much of the work requires the use of drafting tools and techniques.

Most pattern makers pick up the skills of the trade by working for several years as helpers to experienced pattern makers. Cutters and pattern graders are occasionally promoted to pattern making. Pattern makers must be able to visualize from a sketch or model the size, shape, and number of pattern pieces required for a particular garment. They also must have a

knowledge of fabrics, body proportions, and garment construction.

For beginning tailor and dressmaking jobs, many employers prefer to hire vocational school graduates who have had courses in these subjects. With a few years of additional apprenticeship or informal on-the-job training, graduates can qualify as skilled workers. Some of these workers eventually become designers or supervisors. They can also transfer to jobs outside the apparel manufacturing industry as fitters and alteration tailors in clothing stores and drycleaning shops.

Pressers usually begin as underpressers, working on simple seams and garment parts. Underpressing can be learned in a short time, and the worker can progress to the more difficult job of finish presser. These workers also can transfer to pressing jobs in drycleaning shops.

Many apparel firms prefer to recruit designers from colleges that offer specialized training in this field. Graduates usually start as assistant designers or sample makers. Some designers, however, have come up through the ranks by advancing from cutting, pattern making, or tailoring jobs.

Designers need a thorough knowledge of fabrics, a keen sense of color, and the ability to translate design ideas into a finished garment. They should also acquaint themselves with garment making techniques by working briefly in various plant jobs, such as sample making, cutting, and machine sewing. Designers should know how to sketch.

A production manager usually begins as a management trainee, and an industrial engineer as a junior engineer. A college education increasingly is being required for these jobs. For those without a college background, many years of on-the-job training in all production processes, ranging from selection of fabrics to shipment of finished apparel, are required to qualify as a production manager.

Employment Outlook

Apparel industry employment is expected to grow more slowly than the average for all industries through the mid-1980's. Most job openings will arise from the need to replace experienced workers who retire, die, or transfer to other fields of work. The number of openings may fluctuate greatly from year to year, as the demand for apparel is highly sensitive to changes in the economy.

Demand for apparel is expected to increase over the long run as population and incomes continue to grow. The industry's greater emphasis on styling also may stimulate demand. Employment in the industry, however, is not expected to keep pace with the production of apparel, because new mechanized equipment and improved methods of production and distribution are expected to result in greater output per worker. Examples of laborsaving equipment include sewing machines that can position needles and trim threads automatically; devices that automatically position fabric pieces under the needle and remove and stack completed pieces; and computer-controlled pattern making, grading, and cutting. Computers also are improving managerial control over sales, inventories, shipping, and production.

Despite technological advances in equipment, apparel manufacturing operations will continue to require much manual labor. Most employment opportunities will be for sewing machine operators, as this occupational group constitutes approximately 50 percent of total industry employment. Job openings also will arise for pressers and designing and cutting room workers.

Opportunities are expected to be particularly favorable for production managers and engineers with college degrees in apparel management, engineering technology for apparel, and industrial engineering, as well as for salesworkers, fabric buyers, and sewing machine mechanics. People who plan to become designers, on the other hand, will face keen competition, because the number of people trying to get into this field exceeds the number of available jobs.

Earnings and Working Conditions

Earnings in the apparel industry are relatively low. In 1974, production workers in apparel averaged $2.99 an hour, compared with $4.40 an hour for those in all manufacturing industries. Production workers in the apparel industry also worked fewer hours per week than those in manufacturing as a whole.

Average hourly earnings of production workers varied among

Table 1. Average hourly earnings of production workers in the men's and boys' suits and coats industry, selected occupations and areas, 1973

Men's and boys' suits and coats	Estimated average hourly earnings		
	New York & Nassau–Suffolk	Baltimore	Chicago
All production workers	$3.79	$3.32	$3.88
Cutters and markers	5.02	4.42	4.92
Finishers, hand, coat fabrication	3.21	3.20	3.64
Sewing machine operators, coat fabrication	3.84	3.21	3.87
Sewers, hand, trouser fabrication	3.75	3.05	3.65
Sewing machine operators, trouser fabrication	4.10	3.09	3.50

different kinds of apparel plants, ranging from $2.58 in plants that made men's and boys' work clothing to $3.66 in those that made men's and boys' suits and coats. Earnings of apparel workers also varied by occupation and geographical area. Table 1 gives estimated average hourly earnings in 1973 for selected occupations and areas in one segment of the industry.

Because most production workers in the apparel industry are paid by the number of pieces they produce, their total earnings depend upon speed as well as skill.

Many apparel workers are union members, particularly those who work in metropolitan areas. The major unions in this industry are the International Ladies' Garment Workers' Union, the Amalgamated Clothing Workers of America, and the United Garment Workers of America. Some of these unions sponsor health care and child day care centers, cooperative housing, and vacation resorts for the benefit of their members.

Workers may be laid off for several weeks during slack seasons, particularly in plants that make seasonal garments, such as women's coats and suits. Employment is usually more stable in plants that produce standardized garments, such as pajamas and men's shirts, which are worn all year. In many plants, the available work during slack periods is divided so that all workers can be assured of at least some earnings.

While many plants are housed in old buildings, others are located in modern buildings that have ample work space, good lighting, and air conditioning.

Because most employees sit when they sew, the work is not physically strenuous, but the pace is rapid and many tasks are monotonous. A sewer may occasionally pierce a finger with a needle, but serious accidents are rare.

Working conditions in cutting and designing rooms are pleasant. These rooms often are in a separate area of the plant, away from the hustle and bustle of the sewing and pressing operations. Designing, pattern making, and cutting jobs are more interesting and less monotonous than most other apparel jobs.

Sources of Additional Information

Information on vocational and high schools that offer training in designing, tailoring, and sewing may be obtained from the Division of Vocational Education of the Department of Education in each State capital.

Information on apprenticeships may be obtained from the Apprenticeship Council of the State Labor Department or the local offices of State employment service. Some local employment service offices administer tests to determine aptitudes that are important for many apparel industry jobs.

For general information on jobs in the industry and information on schools which offer degrees in apparel management, engineering technology for apparel, design, and related professional and vocational fields, write to:

American Apparel Manufacturers Association, 1611 N. Kent St., Arlington, Va. 22209.

Amalgamated Clothing Workers of America, 15 Union Square, New York, N.Y. 10003.

Clothing Manufacturers Association of U.S.A., 135 W. 50th St., New York, N.Y. 10020.

Fur Information and Fashion Council, 101 W. 30th St., New York, N.Y. 10001.

International Ladies' Garment Workers' Union, 1710 Broadway, New York, N.Y. 10019.

National Dress Manufacturers' Association, Inc., 570 Seventh Ave., New York, N.Y. 10018.

National Outerwear and Sportswear Association, Inc., 1 Pennsylvania Plaza, New York, N.Y. 10001.

New York Coat and Suit Association, 225 W. 34th St., New York, N.Y. 10001.

United Garment Workers of America, 31 Union Square, New York, N.Y. 10013.

OCCUPATIONS IN THE ATOMIC ENERGY FIELD

Atomic energy is a source of heat and radiation that can be used for peaceful as well as military purposes. Although peaceful applications have been expanding rapidly in recent years, they are still in the early stages of development, and continuing research and development programs will be needed during the next several decades to find new and more efficient ways of utilizing this energy.

In 1974, nearly 250,000 people worked in atomic energy activities. Large numbers did research and development work. Others worked in industries that manufacture nuclear weapons and other defense materials, nuclear reactors, and nuclear fuels. Most atomic energy workers are scientists, engineers, technicians, and craft workers.

Applications of Atomic Energy

One significant use of atomic energy is the production of commercial electricity by nuclear reactors. Steam produced by reactors now generates electricity for many communities. These reactors have become competitive with systems that use fossil fuels (such as coal and oil). At the end of 1974, there were 55 nuclear reactors in commercial operation. About 175 plants are now either in the planning stage or being constructed. Dual-purpose nuclear power desalting plants, which would at the same time provide both a new source of fresh water and electric power, are being studied.

Nuclear reactors also power submarines and surface vessels. By eliminating refueling, nuclear propulsion extends the range and mobility of our naval forces.

Although existing reactors already generate huge quantities of power from a small amount of uranium, more efficient reactors may be operational by the mid-1980's. The Liquid Metal Fast Breeder Reactor, which may be commercially operable by the 1990's, actually produces more potential fuel than it consumes. Further in the future, controlled fusion reactors may provide an even more efficient method of producing electricity.

The U.S. Energy Research and Development Administration has continued the research begun by the Atomic Energy Commission's "Project Plowshare," a program to develop peaceful uses for nuclear explosives. The program has potential applications in areas such as gas, oil, and mineral recovery, and the excavation of harbors, canals, and mountain passes.

Another significant application of atomic energy is in the use of radioisotopes. The radioisotopes emit radiation that special instruments, such as thickness gauges, can detect, and are valuable research tools in environmental studies, agriculture, medicine, and industry.

Technicians complete assembly of experimental unit used in atomic energy research.

How Atomic Energy is Produced

Although there are several processes for producing atomic or nuclear energy, the most common method used today is the fission process. It involves splitting uranium or plutonium nuclei by neutron bombardment. When neutrons emitted from this fission process bombard other nuclei, further fission takes place and, under proper conditions, results in a "chain" reaction. This reaction releases energy which is converted into power. The detonation of an atomic bomb is an application of the explosive release of atomic energy. However, for commercial uses, this energy is controlled.

Controlled fission is the essential feature of a nuclear reactor. The reactor is like a furnace, and needs fuel to operate. The principal source material for reactor fuel is uranium 235. Uranium in its natural state contains less than 1 percent of readily fissionable material, U-235. Although natural uranium is sometimes used as reactor fuel, a more concentrated and enriched fuel is produced and used by increasing the proportion of U-235 isotopes through a process called gaseous diffusion. The rate of fission and energy produced in a nuclear reactor usually is controlled by inserting special neutron-absorbing rods into the fuel chamber or "core."

When atomic energy is used commercially for power, the heat generated must be converted to electricity by conventional equipment. The major difference between nuclear and conventional thermal electric power stations is that the steam to drive turbines comes from a nuclear reactor rather than from conventional power sources. (See accompanying chart.)

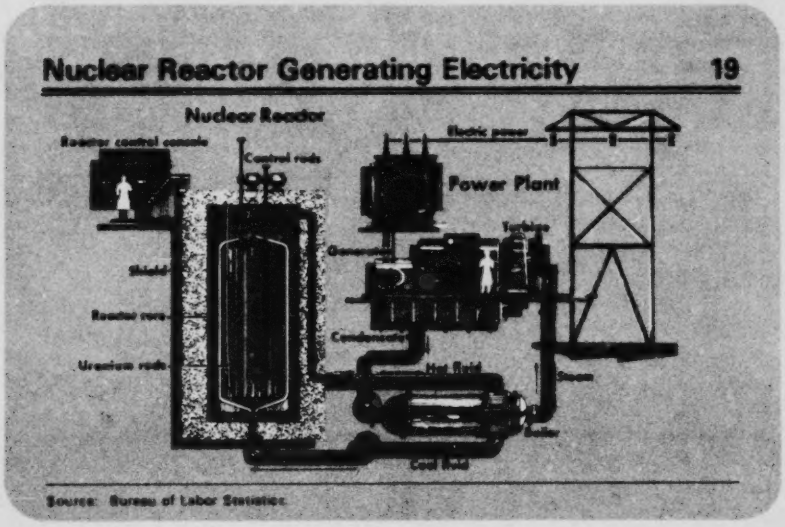
Because of the potential hazards of nuclear radiation, special radiation-resistant materials are used in reactors and precautions are taken to protect personnel.

Nature of the Atomic Energy Field

Many kinds of research and industrial activities are required for the production and use of nuclear energy. These processes include the mining, milling, and refining of uranium-bearing ores; the production of nuclear fuels; the manufacture of nuclear reactors, reactor components, and nuclear instruments; the production of special materials for use in reactors; the design, engineering, and construction of nuclear facilities; the operation and maintenance of nuclear reactors; the disposal of radioisotopes; the production of nuclear weapons; and research and development work.

These activities take place in plants, laboratories, and other facilities. Some work, such as mining and milling, manufacturing heat transfer equipment, and constructing facilities, differs little from similar work in other fields. Other activities, however, such as producing fuels needed to run reactors, are unique to the atomic energy field.

The Federal Government supports over half of the basic atomic energy activities, though private support has been increasing. The U.S. Energy Research and Development Administration (ERDA) directs the Federal Government's atomic energy research program, and the Nuclear Regulatory Commission (NRC) controls the use of nuclear materials by private organizations. The operation of ERDA-owned facilities, including laboratories, uranium processing plants, nuclear reactors, and weapons manufacturing plants, is contracted to private organizations. About half of all workers in the atomic energy field are employed in government-owned facilities. Privately owned facilities do all types of atomic energy work except for the development and production of military weapons and certain nuclear fuel-processing operations. A large amount of research and development work is carried out in ERDA-owned laboratories, university and college laboratories, nonprofit institutions, and industrial organizations under ERDA contracts.



Occupations in the Atomic Energy Field

Engineers, scientists, technicians, and craft workers account for a

higher proportion of total employment in this field than in most others, mainly because much of the work is still in the research and development phase. Office personnel in administrative and clerical jobs represent another large group. Most of the remainder are semiskilled and unskilled workers involved in production operations, plant protection, and services.

Although many engineers working in the atomic energy field are trained in nuclear technology, engineers trained in other fields also are employed. Mechanical engineers are the largest single group, but many electrical and electronic, chemical, civil, and metallurgical engineers also are needed. Many of these engineers do research and development work; others design nuclear reactors, nuclear instruments, and other equipment.

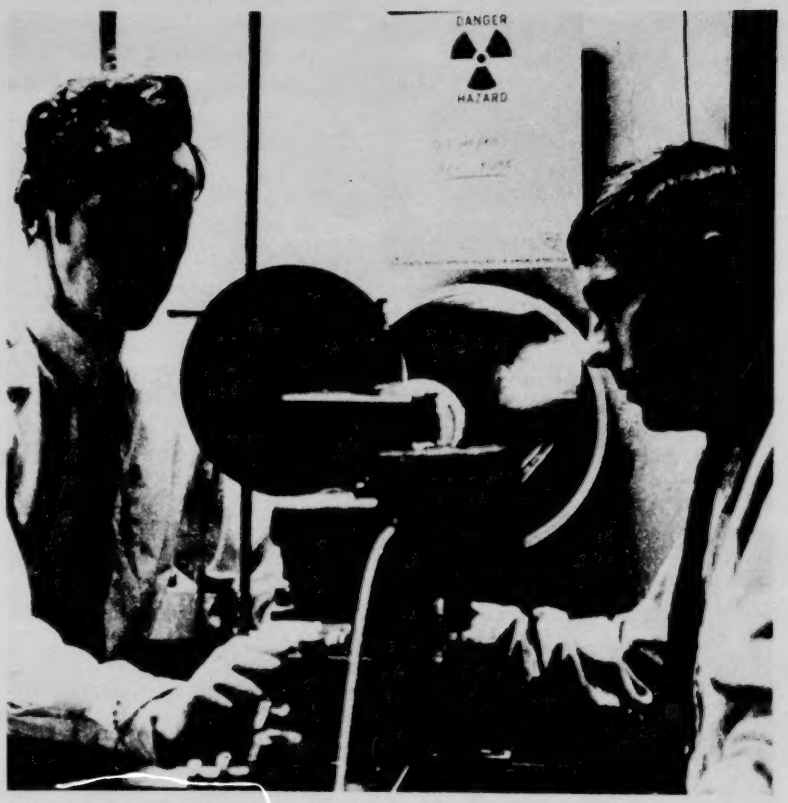
Research laboratories and other organizations that do atomic energy work employ scientists in basic and applied nuclear research. Most are physicists and chemists, but mathematicians, biological scientists, and metallurgists also do atomic energy research.

Large numbers of engineering and science technicians, drafters, and radiation monitors assist engineers and scientists in research and development and in designing and testing equipment and materials.

Many highly skilled workers build equipment for experimental and pilot work and maintain the complex equipment and machinery. Maintenance mechanics and all-round machinists work in most atomic energy activities, as do electricians, plumbers, pipefitters, and other craft workers and chemical process operators.

Activities in the Atomic Energy Field

The following briefly describes some major atomic energy activities and their workers.



Chemists operate "light splitting" device used in studying the motion of atomic particles.

Uranium Exploration and Mining. The 6,500 people employed in uranium exploration and mining in 1974 had jobs similar to those in mining of other metallic ores. They mainly work in the Colorado Plateau area of the Far West, in the States of New Mexico, Wyoming, Utah, Colorado, and Arizona. A relatively small number of mines account for the bulk of production and employment. Most workers in uranium mines are in production jobs such as miners and drillers in underground mines, and truckdrivers, bulldozer operators, and machine loaders at open pit mines. About 1 out of 8 employees in uranium exploration and mining is in a professional job, such as mining engineer or geologist.

Uranium Ore Milling. In uranium mills, metallurgical and chemical processes are used to extract uranium from mined ore. Uranium mills, located primarily in the Colorado Plateau, employed about 1,400 workers in 1974.

These mills employ skilled machinery repairers, millwrights, pipefitters, carpenters, electricians, and chemical process operators. A small proportion of those working in milling operations are scientists and engineers.

Uranium Refining and Enriching. Milled uranium is chemically processed to remove impurities and converted to metal or intermediate chemical products for reactor fuel preparation. Conventional chemical and metallurgical processes are used, but they must meet more exacting standards than in most other

industries. The output of refining plants may be further processed to obtain enriched uranium.

Activity in this segment of the atomic energy field is centered in Ohio, Tennessee, Kentucky, and Illinois. In 1974 uranium refining and enriching plants employed about 7,900 workers.

Maintenance craft workers, particularly in the highly automated uranium enriching plants, constitute a large proportion of skilled workers. Large numbers of chemical process operators also are employed. More than a third of the engineers and scientists are chemical engineers and chemists.

Reactor Manufacturing. About 27,700 people were employed in the design and manufacturing of nuclear reactors and reactor parts in 1974. Reactor manufacturers do extensive development work on reactors and auxiliary equipment, design reactors, and generally build most of the intricate components, such as fuel elements, control rods, and reactor cores.

About one-third of the employees in firms that design and manufacture reactors are scientists, engineers, and technicians. Engineers alone represent more than one-quarter of the employment. Most are mechanical engineers and reactor engineers who specialize in reactor technology. Assisting these engineers and scientists are many drafters and engineering technicians.

Skilled workers, mostly all-round machinists, are employed by reactor manufacturers in experimental, production, and maintenance work. Other craft workers such as sheetmetal workers, instrument makers, machinery repairers, instrument repairers, and electricians also are employed. Reactor manufacturers employ nuclear reactor operators to operate experimental and test reactors.

Reactor Operation and Maintenance. About 7,700 workers operated and maintained nuclear reactors in 1974. Nuclear power stations employ reactor operators, mechanical, electrical and electronic engineers, instrument and electronic technicians, radiation monitors, and other plant operators and attendants. Machinery and instrument repairers, electricians, and pipefitters maintain and repair the reactors.

Research and Development Facilities. A number of research and development laboratories are operated for ERDA by universities and industrial concerns. These facilities are major centers for basic and applied nuclear research in engineering, physical and life sciences, and in the development of nuclear reactors and other nuclear equipment. More than half of the 33,000 employed in ERDA research and development facilities are engineers, scientists, and supporting technicians, including radiation monitors.

Administrative and clerical workers account for a large proportion of employment. Skilled workers include large numbers of machinists, electricians, machinery repairers, and millwrights, and many tool and diemakers, instrument makers, and pipefitters. Nuclear reactor operators operate research and test reactors and many service workers are employed in plant protection and security operations.

Although most nuclear energy research is in ERDA research and development facilities, additional research is done in privately owned laboratories of educational institutions, other nonprofit institutions, and industrial concerns. In 1974, about 4,000 persons worked in such facilities, nearly 3 out of 4 in scientific, engineering, and technical jobs.

Production of Nuclear Weapons and Other Defense Materials. Establishments that produce nuclear weapons and weapon components, plutonium, and other defense materials employed about 31,000 people in 1974. Most skilled workers are machinery repairers and millwrights, chemical process operators, machinists, electricians, instrument repairers, pipefitters, tool and diemakers, and instrument makers.

Among the large number of scientists and engineers employed at these facilities are physicists, chemists, and mechanical, electrical, and electronic engineers. Many engineering and physical science technicians, drafters, and radiation monitors assist scientists and engineers.

Construction of Nuclear Facilities. In 1974, about 43,000 persons worked on the construction of nuclear facilities—almost all were craft workers. Over 11,000 of these were pipe- and steamfitters, 5,300 were electricians, and 7,300 were laborers. Several thousand carpenters, ironworkers, operating engineers, and boilermakers also were required in nuclear construction.

Other Atomic Energy Activities. Over 2,400 workers produce special materials such as beryllium, zirconium, and hafnium for use in reactors. About 8,000 workers are in companies that make reactor control instruments, radiation detection and monitoring devices, and other instruments. Production of these instruments is similar to other instrument manufacturing. Large numbers of engineers and technicians are employed in these industries.

Roughly 800 people were employed by manufacturers of particle accelerators and their specialized components. Particle accelerators enable scientists to study the structure and properties of elementary particles in the nucleus of an atom.

Other workers process and package radioisotopes, produce radiography units and radiation

gauges and package and dispose of radioactive waste.

Government Employment. In 1974, the Atomic Energy Commission employed nearly 8,000 workers (about 2,000 were scientists or engineers). In January 1975, however, the AEC was disbanded. About 6,000 workers began working in the new Energy Research and Development Administration, while about 2,000 joined the newly formed Nuclear Regulatory Commission. Since ERDA and NRC are primarily administrative and regulatory agencies, nearly 9 out of 10 employees are in administrative, professional, or clerical jobs. Several thousand employees are engaged in atomic energy work in other Federal agencies and in regulatory activities and radiological health programs of State and local governments.

Unique Atomic Energy Occupations. Most of the occupations discussed in the preceding sections are similar to those found in other industrial activities, even though they may have job titles unique to the atomic energy field (such as nuclear engineer, radiation chemist, and nuclear reactor operator) and require some specialized knowledge of atomic energy. (A detailed discussion of the duties, training, and employment outlook for most of these occupations appears elsewhere in the *Handbook*.)

The health physics occupations, which are unique to the atomic energy field, and some other occupations that require training in the field or in the handling and use of radioactive materials or radiation producing equipment, are discussed briefly in the following sections.

Health physicists (sometimes called radiation or radiological physicists or chemists) detect radiation and apply safety standards to control exposure to it. In 1974 nearly 800 health physicists were employed in radiation protection work, research, or teaching.

Health physicists are responsible for planning and organizing radiological health programs at atomic energy facilities. They establish inspection standards and determine procedures for protecting employees and eliminating radiological hazards. Some supervise the inspection of work areas with potential radiation hazards and prepare instructions covering safe work procedures.

Health physicists also plan and supervise training programs dealing with radiation hazards and advise others on methods of dealing with them. In some cases, they work on research projects dealing with the effects of human exposure to radiation and may develop procedures for using radioactive materials.

Radiation monitors (also called health-physics technicians) generally work under the supervision of health physicists. Almost 2,000 radiation monitors were employed in the atomic energy field in 1974. They use special instruments to monitor work areas and equipment to detect radioactive contamination. Soil, water, and air samples are taken frequently to determine radiation levels. Monitors also may collect and analyze radiation detectors, such as film badges and pocket detection chambers, worn by workers. They calculate the amount of time that personnel may work in contaminated areas, considering maximum radiation exposure limits and the radiation level. Monitors also give instructions in radiation safety procedures and prescribe special clothing requirements and other safety precautions for workers entering radiation zones.

Nuclear reactor operators perform work in nuclear power stations similar to that of boiler operators in conventional ones; however, the controls they operate are different. They also help to load and unload reactor cores. Those who work with research and test reactors check reactor control panels and adjust controls to maintain specified operating conditions within the reactor. About 1,700 people worked as nuclear reactor operators in 1974.

Accelerator operators set up, maintain, and coordinate the operation of particle accelerators. They adjust machine controls to accelerate electrically charged particles, based on instructions from the

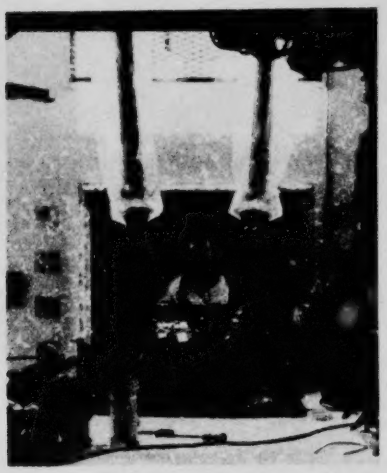
Health physics technician counting routine smear surveys obtained from plantsite.

scientist in charge of the experiment, and set up target materials that are to be bombarded by the particles.

Radiographers take radiographs to check the quality of metal castings, welds, and other objects by adjusting the controls of an X-ray machine, or by exposing the object to be radiographed to a source of radioactivity. They select the proper type of radiation source and film and use standard mathematical formulas to determine exposure distance and time.

Hot-cell technicians operate remote-controlled equipment to test radioactive materials that are placed in hot cells—rooms enclosed with radiation shielding materials such as lead and concrete. By controlling "slave manipulators" (mechanical devices that act as a pair of arms and hands) from outside the cell and observing their actions through the cell window, they perform standard chemical and metallurgical operations with radioactive materials. Hot-cell technicians also enter the cell wearing protective clothing to set up experiments or to decontaminate the cell and equipment. *Decontamination workers* use radiation-detection instruments to locate equipment, plant areas, and materials that have been exposed to radiation. They decontaminate these with special equipment, detergents, and chemicals and verify the effectiveness of the process. *Waste-treatment operators* operate heat exchange units, pumps, compressors, and other equipment to decontaminate and dispose of radioactive waste liquids. *Waste-disposal workers* seal contaminated wastes in concrete containers and transport the containers to a burial ground.

Radioisotope-production operators use remote control manipulators and other equipment to prepare radioisotopes for shipping and perform chemical analyses to ensure that radioisotopes conform to specifications.



Hot cell technician handles highly radioactive material with a remote control manipulator.

Training and Other Qualifications

Training and education requirements and advancement opportunities for most workers in the atomic energy field are generally similar to those doing comparable jobs in other industries. These are discussed elsewhere in the *Handbook* under the specific occupations. However, additional specialized training is required for many workers because the field requires exacting work standards in both its research and production activities, and because it has unique health and safety problems.

Many engineers and scientists in the atomic energy field have advanced training, particularly those doing research, development, and design work. About one-fourth of the scientists and engineers employed in research and development by major ERDA contractors have a Ph. D. degree. While the proportion of engineers with Ph. D. degrees is smaller than that of scientists, graduate training is preferred for an increasing number of both scientific and engineering jobs.

The specialized knowledge of nuclear energy essential for most scientific and engineering positions can be obtained at a college or university or through on-the-job experience.

Colleges and universities have expanded their facilities and curriculums to provide training in nuclear energy. Most people planning to work in the atomic energy field as scientists and engineers choose to major in a specific nuclear discipline, although a degree in a traditional engineering or science curriculum is generally sufficient to begin work in the field. Some colleges and universities award graduate degrees in nuclear engineering or nuclear science. Others offer graduate training in these fields, but award degrees only in the traditional engineering or scientific fields.

Health physicists should have at least a bachelor's degree in physics, chemistry, or engineering, and a year or more of graduate work in health physics. A Ph. D. degree often is required for teaching and research.

Skill requirements for craft workers in the atomic energy field are higher than in most industries because of the precision required to insure efficient operation and maintenance of complex equipment and machinery. For example, pipefitters may have to fit pipe to tolerances of less than one ten-thousandth of an inch and work with pipe made from rare and costly metals. Welding also must meet higher reliability standards than in most fields. These craft workers generally obtain the required additional specialized skills through apprenticeship training programs of employers and unions.

High school graduates who have taken science courses can qualify for on-the-job training as radiation workers, accelerator operators, radiographers, hot-cell technicians, decontamination workers, radioisotope-production operators, and ra-

dioactive waste disposal workers.

Nuclear power reactor operators need a basic understanding of reactor theory and a working knowledge of reactor controls. Most operator trainees are high school graduates. Trainees are often selected from conventional power plant personnel with experience operating boilers, turbines, or electrical machinery. Workers operating nuclear reactor controls must be licensed by the NRC. To qualify for a license, the trainee must pass an operating and written test given by the NRC, along with a medical examination. The preparation for NRC licensing generally lasts at least 1 year. Licenses must be renewed every 2 years however, due to rapid technological change. Consequently, continual retraining is necessary. Additional preparation beyond the operator's license is needed for a senior operator's license, which authorizes the holder to supervise a nuclear control room.

All employees who work in the vicinity of radiation hazards are given on-the-job training in the nature of radiation and the procedures to follow in case of its accidental release.

Individuals who handle classified data (restricted for reasons of national security) or who work on classified projects in the atomic energy field must pass a security clearance.

The Energy Research and Development Administration, at its contractor-operated facilities, supports on-the-job and specialized training programs to help prepare scientists, engineers, technicians, and other workers for the atomic energy field.

Additional educational and training opportunities are offered in cooperative programs arranged by ERDA laboratories with colleges and universities. Temporary employment at these laboratories is available to faculty members and students. Many undergraduate and graduate engineering students work at laboratories and other ERDA facilities on a rotation basis, and many graduate students do their thesis work at ERDA laboratories.

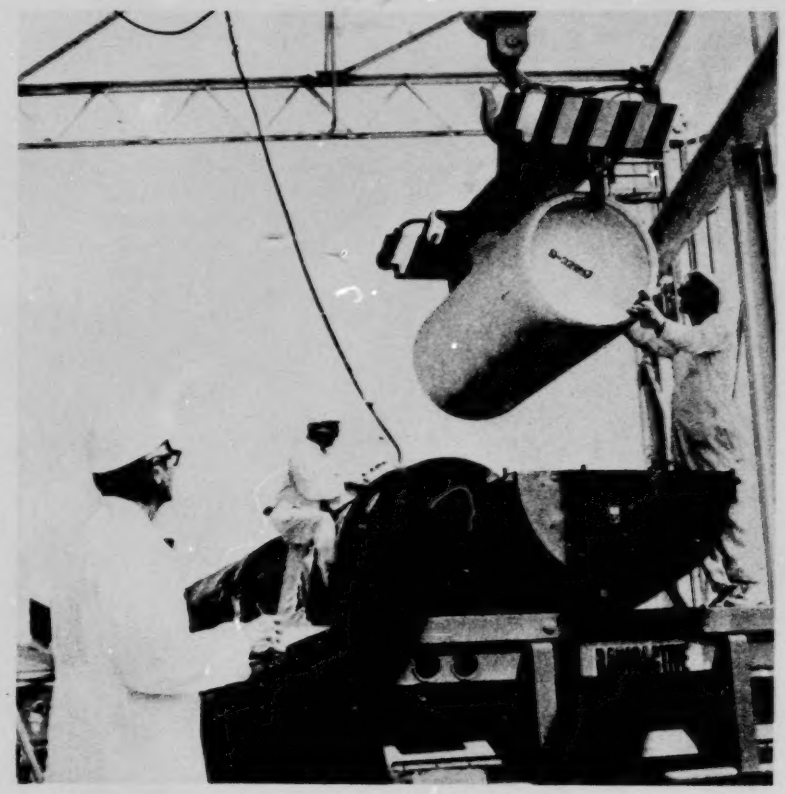
Government contractors often provide employees with training at their own plants or at nearby colleges and universities.

Employment Outlook

Employment in the atomic energy field is expected to grow much faster than the average for all industries through the mid-1980's. Expansion of nuclear generating capacity and continued increases in research and development expenditures will account for most of the growth in the field. Besides the job openings created by employment growth, many openings will occur as workers retire, die, or transfer to other occupations or industries.

The number of nuclear power plants is expected to be several times greater in 1985 than it was in 1974. This anticipated growth will require large increases in the number of workers in the design, construction, operation, and maintenance of these plants. In design, many more engineers and drafters will be required. Construction needs will call for large numbers of pipe- and steamfitters, electricians, carpenters, ironworkers, boilermakers, other craft workers and laborers. Many more reactor operators and maintenance personnel will be needed to bring these plants into operation and keep them running efficiently.

Expansion also will require substantial increases in the sectors involved in mining and milling urani-



Workers load cylinders of enriched uranium for shipment.

um ore, processing reactor fuel, and producing special materials for reactors. As planning of nuclear plants accelerates and more reactors become operable, more regulatory workers will be needed to ensure the quality and safety of these plants. However, public concern about environmental effects of nuclear power plants may cause delays in construction projects, resulting in a slower rate of growth than initially anticipated.

Employment associated with research and development also is expected to increase, though not nearly as fast as in the areas directly affected by nuclear construction. An increasing number of scientists, engineers, and technicians will study methods to improve the efficiency of the nuclear generation of electricity, peaceful uses for nuclear explosives, and the possible bio-medical applications of nuclear science.

Earnings and Working Conditions

Hourly earnings of blue-collar workers employed by contractors at ERDA laboratories and other installations averaged $5.04 in 1974, compared with $4.40 for those in all manufacturing industries.

Professional workers, mostly scientists and engineers, employed at ERDA installations averaged $18,700 a year in 1974, and other white-collar workers (largely clerical and other office personnel) averaged about $9,100 a year. (Earnings data for many of the occupations found in the atomic energy field are included in the statements on these occupations elsewhere in the *Handbook*.)

Working conditions in uranium mining and milling, instrument and auxiliary equipment manufacturing, and construction of facilities are generally similar to those in other industries, except for radiation safety precautions. All uranium mines are equipped with mechanical ventilation systems that reduce the concentration of radioactive radon gas—a substance that can cause lung injury if inhaled over a number of years. Efforts to eliminate this hazard are continuing. Manufacturing facilities, power plants, and research laboratories are generally well-lighted and well-ventilated. Only a small proportion of employees in the atomic energy field actually work in areas where direct radiation dangers exist. Even in these areas, shielding, automatic alarm systems, and other devices and clothing give ample protection to the workers.

Extensive safeguards and operating practices protect the health and safety of workers, and ERDA and its contractors have maintained an excellent safety record. The NRC regulates the possession and use of radioactive materials, and inspects nuclear facilities to insure compliance with health and safety requirements. Constant efforts are being made to provide better safety standards and regulations.

Most hourly paid plantworkers belong to unions that represent their particular craft or industry.

Sources of Additional Information

Information about research programs in the atomic energy field is available from:

U.S. Energy Research and Development Administration, Washington, D.C. 20545.

For information about licensing and safety requirements, contact:

U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

OCCUPATIONS IN THE BAKING INDUSTRY

The baking industry—one of the Nation's largest food-processing employers—provides steady, year-round employment for thousands of workers throughout the country. Jobs exist to suit a wide variety of interests, skills, and talents. Bakery workers make, wrap, pack, sell and deliver products. Mechanics maintain and repair plant machinery and service delivery trucks. Managers and sales specialists direct operations and clerical workers perform regular office duties.

Nature and Location of the Industry

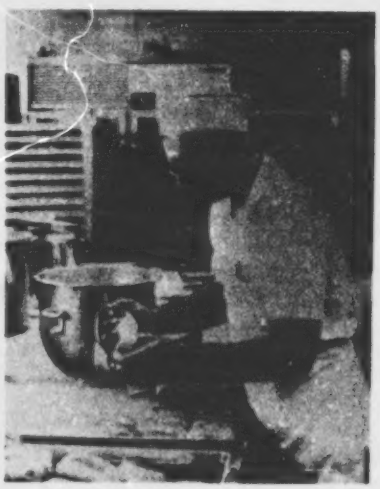
About 250,000 persons worked in the Nation's 3,600 industrial bakeries in 1974. More than 4 out of 5 worked in bakeries that produced perishable goods such as bread, rolls, pies, cakes, and doughnuts. The remainder worked in those that made "dry" goods such as cookies, crackers, and pretzels.

Although there are many small bakeries, the larger plants account for most of the employment. About three-fourths of the industry's employees are in plants with more than 100 workers.

Besides the industrial bakeries, over 12,000 single-shop retail bakeries employed more than 100,000 people in 1974, including shopowners. Because many operations in small bakeries are performed by hand rather than by machine, these shops offer skilled bakers many job opportunities that are not available in large industrial bakeries.

Almost every community has at least one bakery, but jobs are concentrated in metropolitan areas. Most of the industry's employees are production workers. They do the actual baking, handle raw materials, maintain equipment, wrap and pack products, and keep the bakeries clean. Nearly 1 out of 4 drives a truck to deliver the industry's products; most of these workers sell to retail stores. Other drivers with no sales duties deliver bakery products to distribution centers, hotels, restaurants, and stores. The remaining 20 percent of the work force are in administrative, professional, technical, and clerical jobs.

Production Occupations. Although not all baked goods are made in exactly the same way, most bakery production jobs are similar. Production workers blend, sift, and mix ingredients to form a dough; shape and bake the dough; and wrap and pack the final product.



Baker prepares dough for baking.

Since bread is the primary product of the industry, occupations described here are those found in a bread bakery. Jobs may be somewhat different in a bakery which makes other products or is more automated.

The first step in baking is to combine the ingredients needed to make dough. *Mixers* (D.O.T. 520.885) load blending machines with the exact amounts of flour, water and yeast needed for the bread. Using instruments, they carefully control the temperature, timing, and mixing speed of the machines to insure a uniform, well-blended dough. After the dough is mixed, it is dropped into a trough and pushed to a warm proofing room where the yeast ferments and the dough rises. The risen dough is poured back into the blender and sugar, salt, shortening, and more flour and water are added. The dough is allowed to rise again before it is shaped into loaves.

Divider machine operators (D.O.T. 520.885) run machines which divide, round, proof, and shape dough into loaf-size balls. A conveyor carries these balls of dough to *dough molders* or *molding machine operators* (D.O.T. 520.885) who press out the air bubbles, form the balls into loaves, and drop the loaves into pans. If bread or rolls are to be made in fancy shapes, *bench hands* (D.O.T. 520.884) knead and form the dough by hand.

The pans of dough go back to the proofing room for about an hour before being placed in the oven. *Oven tenders* (D.O.T. 526.885) load and unload the ovens and adjust the temperature and timing of the ovens to make sure that the bread is properly baked.

Some bakeries use an automatic process called "continuous mix" that eliminates many of the steps described above. With this process all ingredients are mixed at once

and the dough is divided, shaped, put into pans, and then proofed only once before baking.

In small bakeries, *all-round bakers* (D.O.T. 526.781) assisted by helpers, usually handle all the steps needed to turn out finished baked products. In large bakeries, all-round bakers are employed as working supervisors. They direct their employees and coordinate their activity with that in other departments in order to meet production schedules.

A considerable number of *helpers* (D.O.T. 526.886) are employed in baking operations to grease pans, remove bread from pans, push troughs and racks, and wash pans. They may assist all-round bakers and other workers. They have job titles such as doughmixer helper, and oven tender helper.

After baked goods leave the oven and are cooled, several types of workers prepare them for delivery to customers. *Slicing-and-wrapping machine operators* (D.O.T. 521.885) feed loaves of bread onto conveyors leading to the machines, watch the slicing and wrapping operations, adjust the machines, and keep them supplied with bags and labels. A conveyor then takes the wrapped loaves to the shipping platform.

Bakery employees in icing departments give finishing touches to cakes, pastries, and other sweet goods following special formulas of the bakery. *Icing mixers* (D.O.T. 520.885) prepare cake icings and fillings. They weigh and measure ingredients and mix them by machine. They also prepare cooked fillings for pies, tarts, and other pastries. *Hand icers* (D.O.T. 524.884) are skilled workers who decorate special products such as wedding cakes, birthday cakes, and fancy pastries. When the product is uniform or requires no special decoration, the frosting may be applied by *machine icers* (D.O.T. 524.885).

Bakeries also employ many workers in storage, warehousing, and shipping departments. Receiving and stock clerks check, record, and deliver incoming supplies and ingredients to various departments. Packers and checkers make up orders of bakery products for delivery by route drivers.

Cake decorating requires some artistic ability.

Maintenance Occupations. Bakeries employ skilled maintenance workers such as machinists, electricians, and stationary engineers to keep machinery and equipment in good condition. Large plants need many of these workers because their baking operations are highly mechanized. Many bakeries also employ truck mechanics to service their delivery trucks.

Sales and Driving Occupations. Selling and delivering finished baked foods requires many thousands of workers. Some sell baked goods, some drive trucks, and many do both.

Route drivers, (D.O.T. 292.358), work for wholesale bakeries. They deliver baked foods to grocery stores along their routes and collect payment. Attracting new customers and urging old customers to buy more products are a major part of their job. Route drivers usually arrange their baked goods on shelves or display racks in grocery stores although some stores have begun to use their own employees to stock shelves. Drivers also list the items they think the grocers will buy the next day, and these lists are used to help make up the bakery production schedule for the next morning.

Route supervisors assign delivery routes and check delivery schedules. They train new route drivers and may temporarily replace those who are absent. A large bakery may employ several supervisors, each in charge of 6 to 10 route drivers.

Chain grocery store bakeries and multioutlet retail bakeries employ truckdrivers rather than route drivers to deliver baked foods to each of their company's stores. Truckdrivers do not have sales duties, nor do they stock shelves. Each store's stock clerks or sales clerks arrange the displays of baked foods.

Administrative, Clerical, and Professional and Technical Occupations. Administrators in large bakeries and owners of small bakeries coordinate all baking activities, from the purchase of raw materials to the production and delivery of finished goods. In large firms, activities are divided into separate departments or functions and are supervised by plant managers, comptrollers, sales managers, and other executives. Some administrative employees specialize in fields such as accounting, purchasing, advertising, personnel, and industrial relations. Bakeries employ many types of clerical workers, including bookkeepers, cashiers, clerks, business machine operators, typists, and switchboard operators. Some large baking companies have laboratories and test kitchens where chemists, home economists, and their assistants test ingredients and prepare formulas and recipes. (Detailed discussion of the duties, training, and employment outlook for maintenance, sales, driving, administrative, clerical, and technical

personnel appear elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

Training requirements for occupations in the baking industry range from a few days on the job to several years of experience or advanced education. Slicing and wrapping machine operators can learn their job in a few days, but skilled workers, such as all-round bakers, mixers, oven tenders, and other baking specialists, need 3 or 4 years of training. Professional personnel and some administrative workers must have a college degree or considerable experience in their specialty.

Most inexperienced production workers in the baking industry are hired as helpers. They are usually assigned such tasks as carrying ingredients to mixing machines, or pushing troughs of dough to the proofing room. Helpers are often able to learn more advanced baking skills while working alongside experienced bakers, and may be selected to enter an apprenticeship program. Employers usually require an apprentice to be at least 18 years old and have a high school or vocational school diploma. Apprenticeship programs last 3 or 4 years, and include on-the-job training in all baking operations and classroom instruction in related subjects.

Some workers take courses in vocational school or learn baking in the Armed Forces. Such training may not qualify a person as a skilled baker, but it may help in getting a job as an apprentice and perhaps shorten the apprenticeship training period.

Bakers may be promoted to jobs such as working or department supervisors. Some bakers who have developed special skill in fancy cakemaking or piemaking may find jobs in hotel or restaurant bakeries. All-round bakers with some business ability sometimes open their own bakeshops.

Production employees must be in good health because most States require a health certificate indicating that the worker is free from contagious diseases. Good health also is important because of the irregular working hours and high temperature in bakeries.

Some bakeries have apprenticeship programs for maintenance workers such as machinists, electricians, and mechanics. Others train maintenance workers informally on the job. Some bakeries hire only maintenance workers who are already skilled.

For jobs as route drivers or truckdrivers, baking firms generally hire inexperienced people with a high school education. These workers often begin as stock clerks, packers, or checkers, and are promoted to driving jobs. Applicants must be able to get a chauffeur's license and are sometimes tested by the baking companies to determine whether they are safe drivers. Classroom instruction in sales, display, and delivery procedures is sometimes given to new route drivers, but most training is given on the job by supervisors. Route drivers may be promoted to route supervisors or sales managers.

Administrative jobs are usually filled by upgrading personnel already employed in the firm. Some owners and production managers of bakeries have come from the ranks of plant workers and some others began their careers in sales occupations. In recent years, large baking firms have required their new administrative workers to have a college degree in an administrative field, such as marketing, accounting, labor relations, personnel, or advertising. Kansas State University at Manhattan offers a bachelor of science degree in baking science and management. The American Institute of Baking conducts a school of baking for persons with a bachelor's degree who wish to qualify for managerial positions.

Persons who have completed a commercial course in high school, junior college, or a business school are usually preferred for secretarial, stenographic, and other clerical jobs.

Employment Outlook

Employment in the baking industry is expected to change little through the mid-1980's. Nevertheless, several thousand job openings are anticipated each year because of the need to replace workers who retire, die, or transfer to other fields of work.

Population growth will increase the demand for bakery products. However, laborsaving technological innovations will enable many bakeries, particularly the large industrial ones, to meet the demand without increasing employment. Pneumatic handling systems and pumps quickly and easily transfer ingredients from trucks or railroad cars to storage containers. The "continuous mix" process eliminates doughmixing and proofing operations, and conveyor systems move panned dough from ovens to labeling machines in one continuous process. In addition, some bakeries can prepare a week's baked goods at one time and store them in the freezer until needed.

Although the baking industry as a whole is not expected to grow, small retail bakeries may experience employment gains. Because many of these shops produce a wide variety of baked goods in small quantities, laborsaving machinery often is too expensive to be practical.

Earnings and Working Conditions

In 1974, earnings of production workers in the baking industry averaged $170.31 a week, or $4.29 an hour, which is slightly higher than the average for all manufacturing industries. Bakeries producing perishable products generally offer

higher wages than those producing "dry" products.

According to union contracts covering employees in 24 wholesale bakeries producing bread and related products, minimum hourly rates in major occupations in 1974 were as follows:

Baking supervisors and all-round bakers	$4.59–6.64
Molders and dividers and molding and dividing machine operators	4.49–6.24
Mixers (dough or icing)	4.39–6.24
Oven tenders	4.39–6.24
Bench hands	4.26–6.05
Wrapping machine operators	3.47–5.89
Icers and decorators	4.16–5.24

Some plant employees work night shifts and weekends because many bakeries operate around the clock. Some bakeries are eliminating the night shift since baked goods can be frozen and stored until needed. Most plant workers are on a 40-hour workweek, but some work 35 or 37 1/2 hours, and others 44 to 48 hours.

Route drivers usually receive a guaranteed minimum salary plus a percentage of their sales. According to limited information from union contracts, route drivers for wholesale bakeries had minimum weekly salaries of from $119 to $221 in 1974. By selling more baked products to more customers, route drivers can increase their earnings. Companies generally pay for uniforms and their maintenance.

Working conditions in bakeries are generally good. However, many jobs involve some strenuous physical work, despite the considerable mechanization of baking processes. Work near ovens can be hot, especially in the summer.

Nearly all employees of industrial baking firms get paid vacations, which usually range from 1 to 5 weeks according to length of service. Employees also get from 5 to 11 paid holidays, depending on the locality. Most baking companies have life and health insurance programs and retirement pension plans. Many employees are covered by joint union-industry plans which are paid for entirely by the company.

Many bakery workers belong to labor unions. Bakers and other plant workers are organized by the Bakery and Confectionary Workers' International Union of America, and route drivers and truck drivers usually are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind.). Some maintenance workers are members of craft unions such as the International Association of Machinists and Aerospace Workers and the International Union of Operating Engineers.

Sources of Additional Information

Information on baking jobs and training opportunities may be obtained from bakeries in the community, local offices of the State employment service, or locals of the labor unions noted previously.

For general information on job opportunities in the industry and on schools which offer courses or degrees in baking science and technology, write to:

American Bakers Association, 1700 Pennsylvania Ave. NW., Washington, D.C. 20006.

For information on opportunities in retail bakeries, write to:

Associated Retail Bakers of America, 731-735 W. Sheridan Rd., Chicago, Ill. 60613.

OCCUPATIONS IN THE DRUG INDUSTRY

References to potions and spells for the cure and prevention of pain and disease are numerous in medical folklore. But 20th century science has created a supply of drug products undreamed of by even the most imaginative apothecaries of the past.

More than 10,000 prescription drugs are available to today's physician. These drugs have resulted in the control of cardiovascular disease, malaria, pneumonia, and even some forms of cancer. Hormones have relieved the pain and crippling effects of arthritis and other diseases. Tranquilizers and other drugs have done much to reduce the severity of mental illness. Vaccines have reduced dramatically the toll of polio, whooping cough, and measles. Discoveries in veterinary medicine have increased animal productivity and controlled various diseases, some of which are transmissible to humans.

The American drug industry has risen to a position of worldwide prominence by its activities in research and development of new drugs, spending a higher proportion of its funds for research than any other American industry. The largest share of research and development expenditures is devoted to the advancement of scientific knowledge and the development of new products. The remainder is allocated to the improvement of existing products. A large pharmaceutical firm may test 4,000 or more substances a year and spend millions of dollars to develop one new drug.

Because the drug industry looks to its many scientific and technical personnel to carry out its vast research programs, 2 out of every 5 jobs in the industry require more than a high school education.

Nature and Location of the Industry

In 1974, over 160,000 persons worked in the drug industry. About 130,000 worked in plants that made pharmaceutical preparations (finished drugs), such as tranquilizers, antibiotics, and analgesics. Another 18,000 worked in plants that made biological products, such as serums and vaccines; about 14,000 worked in plants that produced bulk medicinal chemicals and botanicals used in making finished drugs.

Drug manufacturing companies typically employ large numbers of workers. About two-thirds of the industry's employees are in plants having more than 500 workers, and some of the largest plants employ more than 5,000.

Nearly four-fifths of the industry's workers were employed in seven States: New Jersey, New York, Indiana, Pennsylvania, Illinois, Michigan, and California. Large drug manufacturing plants are located in Indianapolis, Ind.; Chicago, Ill.; Nutley and Rahway, N.J.; Philadelphia, Pa.; Detroit and Kalamazoo, Mich.; Pearl River and Brooklyn, N.Y.; and in the Los Angeles and San Francisco, Calif. areas.

For testing new drugs, a primary research method is used, called screening. In screening an antibiotic, for example, a sample is placed in a bacterial culture. If positive results follow, the antibiotic is next tested on infected laboratory animals. Promising compounds are studied further for evidence of useful—and harmful—effects. A new drug will be selected for testing in humans only if it promises to have therapeutic advantages over comparable drugs already in use, or if it offers the possibility of being safer.

After laboratory screening, a clinical investigation, or trial of the drug on human patients, is made. Supplies of the drug are given to a small circle of doctors who administer it to carefully selected consenting patients. The patients are then observed closely and special studies made to determine the drug's effect. If a drug proves useful, arrangements are made for more tests with a larger group of physicians, including some in private practice.

Once a drug has successfully passed animal and clinical tests and has been approved by the Food and Drug Administration (FDA), problems of production methods and costs must be worked out before manufacturing begins. If the original laboratory process of preparing and compounding the ingredients is complex and expensive, pharmacists, chemists, chemical engineers, packaging engineers, and production specialists are assigned to develop processes economically adaptable to mass production.

Drug manufacturers have developed a high degree of automation in many production operations. Milling and micronizing machines (which pulverize substances into extremely fine particles) are used to reduce bulk chemicals to the required size. These finished chemicals are combined and processed further in mixing machines. The mixed ingredients may then be mechanically capsulized, pressed into tablets, or made into solutions. One type of machine, for example, automatically stamps, fills, and seals capsules. Other machines fill bottles with capsules, tablets, or liquids, and seal, label, and package the bottles.

Drug products are inspected at various stages during the manufacturing process to insure that they conform to specifications. Although some inspection operations are mechanized, many are performed manually.

Occupations in the Industry

Employees with many different levels of skill and education work in the drug industry. More than half are in white-collar jobs (scientific, technical, administrative, clerical, and sales); most of the remainder are in plant jobs (processing or production, maintenance, transportation, and custodial).

Some of the important occupations are described briefly below. Detailed discussions of professional, technical, clerical, and other occupations found in drug manufacturing, as well as in other industries, are given elsewhere in the *Handbook*.

Scientific and Technical Occupations. About 1 out of every 5 employees in the industry is a scientist, engineer, or technician—a far greater proportion than in most other industries. The majority do research to develop new drug products. Others work to streamline production methods and improve quality control.

Chemists (D.O.T. 022.081) make up the largest group of scientific and technical personnel in the industry. Organic chemists combine new compounds for biological testing. Physical chemists separate and identify substances, determine molecular structure, help to create new compounds, and improve manufacturing processes. Biochemists study the action of drugs on body processes. Radiochemists trace the course of drugs through body organs and tissues. Pharmaceutical chemists set standards and specifications for the form of products and for storage conditions and see that labeling and literature meet the requirements of State and Federal laws. Analytical chemists test raw and intermediate materials and finished products for quality.

Nearly one-fourth of the drug industry's employees are in scientific and technical occupations.

Several thousand *biological scientists* (D.O.T. 041.081, .181) work in the drug industry. Biologists and bacteriologists study the effect of chemical agents on infected animals. Microbiologists grow strains of microorganisms which produce antibiotics. Physiologists investigate the effect of drugs on body functions and vital processes. Pharmacologists and zoologists study the effect of drugs on animals. Virologists grow viruses, develop vaccines, and test them in animals. Botanists, with their special knowledge of plant life, contribute to the discovery of botanical ingredients for drugs. Other biological scientists include pathologists, who study normal and abnormal cells or tissues, and toxicologists, who are concerned with the safety, dosage levels, and the compatibility of different drugs. Pharmacists perform research in product development, studying many forms of medicines at various stages of production. Some set specifications for the purchase and manufacture of materials, and handle correspondence relating to products. Drug manufacturers also employ physicians and veterinarians.

Engineers make up a small fraction of scientific and technical workers. *Chemical engineers* (D.O.T. 008.081) design equipment and devise manufacturing processes. *Industrial engineers* (D.O.T. 012.081, .168, .187, .188, and .281) plan equipment layout and workflow to

maintain efficient use of plant facilities. *Mechanical engineers* (D.O.T. 007.081, .151, .181, and .187) coordinate the installation and maintenance of sterilizing, heating, cooling, humidifying, and ventilating equipment.

Technicians (D.O.T. 073.381, 078.128, .168, .281, .381, and .687) represent about one-fourth of the drug industry's scientific and technical workers. Laboratory tests play an important part in the detection and diagnosis of disease and in the discovery of medicines. Laboratory technicians perform these tests under the direction of scientists in such areas as bacteriology, biochemistry, microbiology, virology (the study of viruses), and cytology (analysis of cells).

Administrative, Clerical, and Related Occupations. About 1 out of every 3 workers in drug manufacturing is in an administrative, clerical, or other office job. At the top of the administrative group are the executives who make policy decisions concerning matters of finance, marketing, and research. Other administrative and executive workers are accountants, lawyers, purchasing agents, personnel and industrial relations workers, and advertising and marketing research workers. Clerical employees keep records on personnel, payroll, raw materials, sales, shipments, and plant maintenance.

Pharmaceutical detailers (D.O.T. 266.158), often called pharmaceutical representatives, describe their companies' products to practicing and teaching physicians, pharmacists, dentists, and hospital administrators.

Plant Occupations. Nearly half of the industry's employees work in plant jobs. The majority of these workers can be divided into three major occupational groups: production or processing workers, who operate the drug producing equipment; maintenance workers, who

Pharmaceutical detailer checks hospital drug supplies.

install, maintain, and repair this equipment; and shipping clerks, truck drivers, and material handlers, who help transport the drugs.

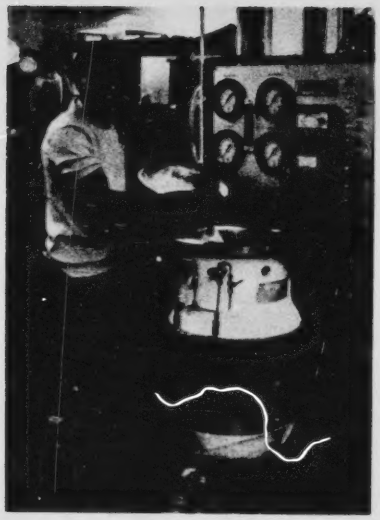
Pharmaceutical operators (D.O.T. 559.782) control machines that produce tablets, capsules, ointments, and medicinal solutions. *Granulator machine operators* (D.O.T. 559.782) tend milling and grinding machines that reduce mixtures to particles of designated sizes. *Compounders* (D.O.T. 550.885) tend tanks and kettles in which solutions are mixed and compounded to make up creams, ointments, liquid medications, and powders. *Compressors* (D.O.T. 556.782) operate machines that compress ingredients into tablets. *Pill and tablet coaters* (D.O.T. 554.782), often called capsule coaters, control a battery of machines that apply coatings to tablets which flavor, color, preserve, add medication, or control disintegration time. *Tablet testers* (D.O.T. 559.687) inspect tablets for hardness, chippage, and weight to assure conformity with specifications.

Pharmaceutical operator fills capsules with powdered medication.

Ampoule fillers (D.O.T. 559.885) operate machines that fill small glass containers with measured doses of liquid drug products. *Ampoule examiners* (D.O.T. 559.687) examine the ampoules for discoloration, foreign particles, and flaws in the glass.

After the drug product is prepared and inspected, it is bottled or packaged. Most of the packaging and bottle filling jobs are done by semiskilled workers who operate machines that measure exact amounts of the product and seal containers.

The drug industry employs many skilled maintenance workers to assure that production equipment is operating properly and to prevent costly breakdowns. Included among maintenance workers are power plant operators who are responsible for high pressure boilers, turbogenerators, compressors, refrigeration equipment, and plant water systems; electricians who install, maintain, and repair the various types of electrical equipment; plumbers who install and maintain heating, plumbing, and pumping systems; machinists who make and



Compounder tends tank in which solutions are mixed.

repair metal parts for machines and equipment; and instrument repairers who periodically inspect instruments and controls and repair or replace malfunctioning parts.

Plant workers who do not operate or maintain equipment perform a variety of other tasks. Some drive trucks to make deliveries to other parts of the plant; some load and unload trucks and railroad cars; others keep inventory records. The industry also employs custodial workers, such as guards and janitors, whose duties are similar to those of such workers in other industries.

Training, Other Qualifications, and Advancement

The training requirements for jobs in the drug industry range from a few hours of on-the-job training to years of preparation.

For production and maintenance occupations, drug manufacturers generally hire inexperienced workers and train them on the job; high school graduates are preferred by most firms. Beginners in production jobs assist experienced workers and learn the operation of the processing equipment. With experience, employees may advance to more skilled jobs in their departments. Most maintenance jobs are filled by people who start as helpers to electricians, plumbers, machinists, and other craft workers.

Many companies encourage production and maintenance workers to take courses related to their jobs in local schools and technical institutes, or to enroll in correspondence courses. Some companies reimburse the workers for part, or all, of the tuition. Skilled production and maintenance workers with leadership ability may advance to supervisory positions.

For technicians in the drug industry, methods of qualifying for jobs vary in many ways. Most technicians enter the field with a high school education and advance to jobs of greater responsibility with experience and additional formal education. However, companies prefer to hire graduates of technical institutes or junior colleges, or those who have completed college courses in chemistry, biology, mathematics, or engineering. In many firms, inexperienced workers begin as laboratory helpers or aides, performing routine jobs such as cleaning and arranging bottles, test tubes, and other equipment.

The experience required for higher levels of technician jobs varies from company to company. Generally, a minimum of 1 year of experience is required for assistant technician jobs, 3 years for technician, 6 years for senior technician, and 10 years for technical associate. Some companies require senior technicians and technical associates to complete job-related college courses.

For most scientific and engineering jobs, a bachelor of science degree is the minimum requirement. Some companies have formal training programs for college graduates with engineering and scientific backgrounds. These trainees work for brief periods in the various divisions of the plant to gain a broad knowledge of drug manufacturing operations before being assigned to a particular department. In other firms, newly employed scientists and engineers are immediately assigned to a specific activity such as research, process development, production, or sales. Drug manufacturing companies prefer to hire college graduates, particularly those with strong scientific backgrounds as pharmaceutical detailers. Newly employed pharmaceutical representatives complete rigorous formal training programs revolving around their companies' product lines.

Job prospects and advancement are usually best for professionals with advanced degrees. Some companies offer training programs to help scientists and engineers keep abreast of new developments in their fields and to develop administrative skills. These programs may include meetings and seminars with consultants from various fields. Many companies encourage scientists and engineers to further their education; some provide financial assistance for this purpose. Publication of scientific papers is also encouraged.

Employment Outlook

Drug manufacturing employment is expected to grow about as fast as the average for all industries through the mid-1980's. Most job openings, however, will result from the need to replace experienced workers who retire, die, or transfer to other fields of work.

The demand for drug products is expected to grow very rapidly. Demand will be stimulated primarily by population growth, particularly the growing number of older people who require more health care services, and the growth of coverage under comprehensive health insurance programs including Medicare and Medicaid. Other factors which are expected to increase the demand for drugs include

greater personal income, the rising health consciousness of the general public, and the discovery of new drugs to treat illnesses not yet responding to therapy. A continued rise in drug sales to other countries, particularly developing countries with mounting health care requirements, also is anticipated.

The industry's employment will not increase as rapidly as the demand for drug products, because technological improvements in production methods will increase output per worker. The more widespread use of automatic processing and control equipment in operations formerly done by hand will tend to reduce labor requirements, particularly in plants where common drugs are mass-produced. For example, mixing and granulating processes, which precede tableting, have become completely mechanized in some plants. Computers in quality control systems are used to eliminate computational errors in analysis and testing and to speed up production and shipment.

Rates of employment growth will vary among occupations. The numbers of scientists, engineers, technicians, and maintenance workers are expected to increase faster than those of other occupational groups in the industry. Demand for scientists, engineers, and technicians will be spurred by continued expansion of research and development activities. More skilled maintenance workers (such as electricians, machinists, plumbers, and instrument repairers) will be needed to service the growing amount of automatic processing and control equipment. Employment of administrative and clerical workers is expected to increase moderately; however, most semiskilled plant occupations are expected to increase slowly, as more processes are adapted to automatic equipment.

Unlike many other manufacturing industries, drug industry employment is not highly sensitive to changes in economic conditions. Thus, even during periods of high unemployment, work is likely to be relatively stable in the drug industry.

Earnings and Working Conditions

Earnings of plant workers in the drug industry are higher than the average for all manufacturing industries. For example, in 1974, production workers in the drug industry averaged $4.62 an hour, while those in manufacturing as a whole averaged $4.40 an hour.

National wage data are not available for individual occupations in the drug industry. However, statements on specific occupations, such as chemist, pharmacist, and technician, in other parts of the *Handbook*, will give general earnings information.

Some employees work in plants that operate around the clock—3 shifts a day, 7 days a week. In most plants, workers receive extra pay when assigned to second or third shifts. Since drug production is subject to little seasonal variation, work is steady.

Working conditions in drug plants are better than in most other manufacturing plants. Much emphasis is placed on keeping equipment and work areas clean because of the danger of contamination to drugs. Plants are usually air-conditioned, well-lighted, and quiet. Ventilation systems protect workers from dust, fumes, and disagreeable odors. Special precautions are taken to protect the relatively small number of employees who work with infectious cultures and poisonous chemicals. With the exception of work performed by material handlers and maintenance workers, most jobs require little physical effort. The frequency of injuries in drug manufacturing has been about half the average for all manufacturing industries.

Some of the industry's production and maintenance employees are members of labor unions. The principal unions in the industry are The Oil Chemical and Atomic Workers International Union; the International Chemical Workers Union; and District 50, United Steel Workers of America (Ind.).

Sources of Additional Information

For information about careers in drug manufacturing, write to the personnel departments of individual drug manufacturing companies and to:

Pharmaceutical Manufacturers Association, 1155 Fifteenth St. NW., Washington, D.C. 20005.

OCCUPATIONS IN THE ELECTRONICS INDUSTRY

An astronaut, a doctor, a mechanic, and a business executive all have something in common; without electronic devices they would be unable to do much of their work. We would never have reached the moon without the thousands of people working in electronics research and production. Nor would doctors be able to diagnose and treat many diseases without modern electronic machines. Mechanics use electronic testing equipment to locate malfunctioning parts in numerous types of machines and engines. Business executives also owe a lot to electronics. Electronic computers, for example, have helped them in such areas as inventory control, market research, and production scheduling.

Nature and Location of the Industry

The electronics industry dates back to the early 1920's when the first radios were produced. By the end of World War II, the industry had diversified its production to include defense equipment. With the development of television and the computer, the electronics industry expanded even further to manufacture a wide range of products.

Today, the industry is divided into four main market areas: government products, industrial products, consumer products, and components. Products sold to the government make up a large portion of electronic sales. Included in government purchases are widely different products such as missile and space guidance systems, communications systems, and other electronic goods used in medicine, education, crime detection, and traffic control.

Electronic products have become an important part of daily business operations. Industrial purchases include computers, radio and television broadcasting equipment, and production control equipment.

Consumer products are probably the most familiar types of electronic products. Every day thousands of people buy television sets, radios, microwave ovens, stereos, and calculators.

Components are needed to manufacture and repair electronic products. Some of the most well-known components are capacitors, switches, transistors, relays, television picture tubes, and amplifiers.

Nearly 1.5 million workers were employed in the electronics industry in 1974. About 1,025,000 worked in plants that produce end products for government, industrial, and consumer use. The rest worked in plants that made electronic components.

Electronics manufacturing workers are located in all parts of the country, but the majority of the jobs in 1974 were in eight States: California, New York, Illinois, Massachusetts, Pennsylvania, Indiana, New Jersey, and Texas. Metropolitan areas with large numbers of electronics manufacturing workers include Los Angeles, Chicago, New York, Philadelphia, Newark, Boston, Baltimore, Indianapolis, and Dallas.

In addition to electronics manufacturing plants, electronics workers were employed by the Federal Government, in activities such as research, development, and contract negotiations. Universities and nonprofit research centers employed a relatively small number of electronics workers.

Occupations in the Industry

A wide variety of jobs exists in the electronics manufacturing industry. More than half of all workers are in plant jobs that include production, maintenance, transportation, and service occupations. The rest are scientists, engineers, and other technical workers, and administrative, clerical, and salesworkers.

Professional and Technical Occupations. The electronics industry is very dependent on research and development. As a result, a large proportion of its workers are in engineering, scientific, and other technical jobs. Engineers and scientists alone make up about 1 out of every 9 electronics workers.

Electrical and electronics engineers, the largest group of engineers in the industry, work on research and development, production, and quality control problems. Most of these engineers are highly specialized and may work in a specific area such as the design and implementation of solid-state circuitry in radar, computers, and calculators.

Mechanical engineers help develop new products, tools, and equipment by setting requirements for the strength of materials and designs. Industrial engineers work on production problems such as devising more efficient methods in manufacturing processes or plant layout. Chemical, metallurgical, and ceramic engineers also work for electronics companies.

Physicists work on research and development projects such as developing uses for solid-state circuitry or designing integrated circuits for satellites.

Chemists and metallurgists work mainly in research and in materials preparation and testing. Mathematicians and statisticians help engineers and scientists on complex mathematical and statistical problems, especially in the design of military and space equipment and computers. Statisticians also are employed in quality control, production scheduling, and sales analysis and planning. Industrial designers are concerned with the design of electronic products and the equipment used to manufacture them.

Technicians—such as electronics technicians, drafters, engineering aides, laboratory technicians, and mathematical assistants—make up about 1 out of every 20 electronics manufacturing workers. Many electronics technicians help engineers design and build experimental models. They also set up and repair electronic equipment for customers. Other electronics technicians do complex inspection and assembly work. Drafters prepare drawings from sketches or specifications furnished by engineers.

Engineering aides assist engineers by making calculations, sketches, and drawings, and testing electronic components and systems. Laboratory technicians help physicists, chemists, and engineers in laboratory analyses and experiments. Mathematical assistants follow procedures outlined by mathematicians to solve problems. They also operate test equipment to develop computers and other electronic products.

Technical writers prepare training and technical manuals that describe the operation and maintenance of electronic equipment. They also prepare catalogs, product literature, and contract proposals. Technical illustrators draw pictures of electronic equipment for technical publications and sales literature.

Administrative, Clerical, and Related Occupations. About 1 out of 4 workers in electronics manufacturing has an administrative or other office job. Administrative workers include purchasing agents, sales executives, personnel specialists, advertising workers, and market researchers. Secretaries, typists, and business machine operators are among the thousands of other office workers employed by electronics firms. A growing proportion of these office workers operate computers.

Plant Occupations. About half of electronics manufacturing employees work in plant operations: assembly, capacitor and coil winding, inspecting, machining, fabricating, processing, and maintenance.

Assembly Occupations (D.O.T. 729.884, 720.884, 726.781 and .884). Assemblers, most of whom are semiskilled workers, make up the largest group of employees. Most end products are assembled by hand with small tools, soldering irons, and light welding machines. Assemblers use diagrams to guide their work. Some assembly is done by following instructions presented on color slides and tape recordings. Color slide projectors flash a picture of an assembly sequence on a screen, while the assembler listens to recorded directions.

Precision assemblers and electronics technicians install components and subassemblies in complex products such as missiles. They also help make experimental models. Most of these workers are employed in the manufacture of military and industrial electronic equipment.

Machines are used in some assembly work. For example, in putting together circuit boards, automatic machines often are used to position components on boards and to solder connections. Here the assemblers work as machine operators or loaders. Most components are put together by machines, since their assembly involves simple and repetitive operations. Even some types of miniaturized semiconductors and other components, made with parts small enough to pass through a needle's eye, are assembled by machines.

Hand assembly is needed for some items, such as receiving tubes and some types of resistors and diodes. Hand assemblers may perform only a single operation as components move down the production line, but some put together complete components. Tiny parts often are assembled under magnifying lenses or microscopes. Precision welding equipment may be used to weld connections in microminiature components and circuit assemblies.

Machining Occupations. Machining workers are needed in most electronics manufacturing plants, particularly for military, space, and industrial products. Machine-tool operators and machinists make precise metal parts. Toolmakers construct and repair jigs and fixtures that hold metal while it is being stamped, shaped, or drilled. Diemakers build metal forms (dies) used in stamping and forging metal.

Fabricating Occupations. Fabricating workers are employed in many electronics manufacturing plants,

Assemblers make up the largest group of electronics industry employees.

but most are in plants that make industrial products. Sheet-metal workers make frames, chasis, and cabinets. *Glass blowers* and *glass lathe operators* (D.O.T. 674.782) make tubes for experimentation and development work.

In electron tube manufacturing, special fabricating workers are employed. For example, *grid lathe operators* (D.O.T. 725.884) wind fine wire around two heavy parallel wires to make grids (devices in tubes that control the flow of electrons). Other fabricating workers include *coil winders* (D.O.T. 724.781 and .884), *crystal grinders* and *finishers* (D.O.T. 726.884), and *punch press operators* (D.O.T. 617.885).

Processing Occupations. Many electronics workers process or prepare parts for assembly. *Electroplaters* and *tinners* (D.O.T. 501.885) coat parts with metal; *anodizers* (D.O.T. 501.782) treat these parts in electrolytic and chemical baths to prevent corrosion. Other processing workers also coat electronic components with waxes, oils, plastics, or other materials. Some operate machines which encase microminiature components in plastic. *Silk screen printers* (D.O.T. 726.887) print patterns on circuit boards and on parts of electronic components. *Etching equipment operators* (D.O.T. 590.885) do chemical etching of copper on circuit boards.

Operators of infrared ovens and hydrogen furnaces (D.O.T. 590.885) remove moisture and foreign deposits from ceramic, metal, and glass parts. In tube manufacturing, *exhaust operators* (D.O.T. 725.884) and *sealers* (D.O.T. 692.885) operate gas flame machines that clear tubes of impurities, exhaust the gas, and seal the tubes.

Inspection Occupations. Inspection begins when raw materials enter the plant and continues through manufacturing. Some inspection jobs require electronics technicians who have years of experience. These jobs are commonly found in complex production work such as the manufacture of computers and spacecraft. Most inspectors, however, do not need extensive technical training.

Some inspectors check incoming parts and components supplied by other firms. They may have job titles that indicate the work they do, such as incoming materials inspector or plating inspector.

During manufacturing, components are either checked manually by workers using test meters or routed mechanically through automatic test equipment. Although many of these workers simply are called testers, others have job titles that reflect the type of components they inspect, such as transformer-tester or coil-tester. Some automatic equipment can check components, produce a punched tape of the results, and sort the components into batches for shipping. Workers who feed or monitor automatic equipment often are called test-set operators or testing-machine operators.

Electronic assembly inspectors (D.O.T. 722.281) examine assembled products to make certain that they conform to blueprints and specifications. They inspect wiring, electrical connections, and other critical items to make sure everything will work properly.

Maintenance Occupations. Many workers repair and maintain machinery and equipment. Skilled electricians are responsible for the proper operation of electrical equipment; machine and equipment repairers make mechanical repairs; maintenance machinists and welders build and repair equipment and fixtures. Air-conditioning and refrigeration mechanics work in air-conditioned plants that have special refrigerated and dust free rooms to protect sensitive parts. Painters, plumbers, pipefitters, carpenters, and sheet-metal workers also are employed in electronics plants.

Other Plant Occupations. Many workers move and handle materials. Forklift operators stack crates in warehouses, and load and unload trucks and boxcars. Truckdrivers move freight outside the plant. The industry also employs guards and janitors.

(Detailed discussions of professional, technical, mechanical, and other occupations, found not only in electronics manufacturing plants, but also in other industries, are presented elsewhere in the *Handbook* in sections covering the individual occupations.)

Training, Other Qualifications, and Advancement

Training requirements for jobs in electronics manufacturing plants range from a few hours of on-the-job training to years of specialized preparation. Beginning engineering jobs usually are filled by recent college graduates, but some positions call for advanced degrees. A small number of workers without college degrees, however, are upgraded to professional engineering classifications from occupations such as engineering assistant and electronics technician. Workers who become engineers in this way usually take advanced electronics courses in night school or in other training programs. To keep up with new developments and to qualify for promotion, professional and technical personnel obtain additional training, read technical publications, and attend lectures and technical demonstrations.

Almost all mathematicians, physicists, and other scientists employed in electronics manufacturing have college degrees; most have advanced degrees.

Technicians generally need specialized training to qualify for their

jobs. Most electronics technicians attend either a public, private, or Armed Forces technical school. Some complete 1 or 2 years of college in a scientific or engineering field, and some receive training through a 3- or 4-year apprenticeship program. High school graduates who have had courses in mathematics and science are preferred for apprenticeship programs.

Some workers advance to electronics technician positions from jobs such as tester or laboratory assistant. A relatively small number of plantworkers become technicians. Opportunities for advancement are improved by taking courses either in company-operated classes, night school, junior college, or technical school, or by correspondence.

Electronics technicians need good color vision, manual dexterity, and good eye-hand coordination. Some technicians who test radio transmitting equipment must hold licenses from the Federal Communications Commission as first- or second-class commercial radiotelephone operators.

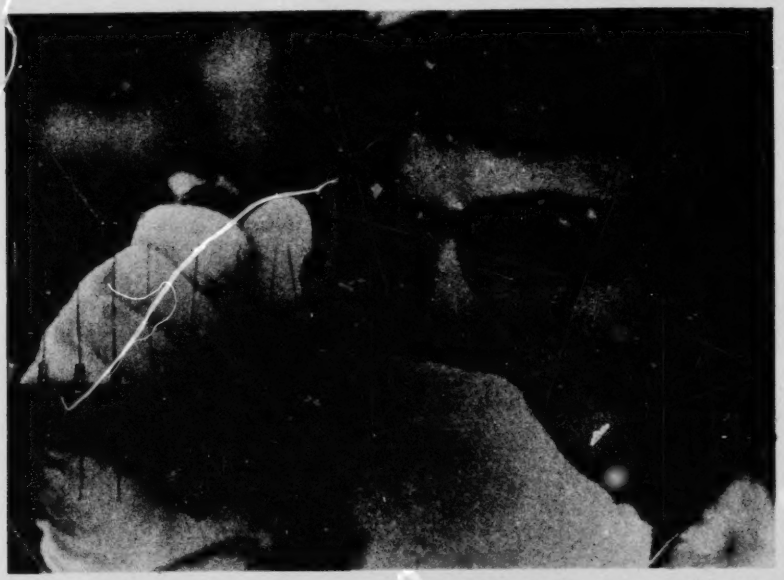
Drafters usually take courses in drafting at a trade or technical school; a few have completed a 3- or 4-year apprenticeship. Under an informal arrangement with their employers, some qualify for both on-the-job training and part-time schooling. Because many drafters in this industry must understand the basic principles of electronic circuits, they should study basic electronic theory.

Technical writers must have a flair for writing and are usually required to have some technical training. Employers prefer to hire those who have had some technical institute or college training in science or engineering. Many, however, have college degrees in English or journalism and receive their technical training on the job and by attending company-operated evening classes. Technical illustrators usually have attended art or design schools.

Many tool and diemakers, machinists, electricians, and other craft workers learn their trades by completing a 4- or 5-year apprenticeship; others are upgraded from helpers' jobs.

Formal training is not necessary for workers entering plant jobs, but a high school diploma or its equivalent is sometimes required. Job applicants may have to pass aptitude tests and demonstrate skill for particular types of work. A short period of on-the-job training generally is provided for inexperienced workers. Assemblers, testers, and inspectors need good vision, good color perception, manual dexterity, and patience.

Requirements for administrative and other office jobs are similar to those in other industries. Some beginning administrative jobs are open only to college graduates with degrees in business administration, law, accounting, or engineering. For clerical jobs, employers usually prefer high school graduates with training in stenography, typing, bookkeeping, and office machines.



Patience and manual dexterity are needed in some electronics assembly jobs.

Employment Outlook

Employment in electronics manufacturing is expected to increase faster than the average for all industries through the mid-1980's. In addition to the jobs resulting from employment growth, large numbers of openings will arise as experienced workers retire, die, or take jobs in other industries.

Production of electronic products will increase as business executives decide to buy more computers and other electronic equipment to automate paper work and production processes. Business spending for electronic communication and testing equipment also will grow. The demand for television receivers, video tape recorders, stereo systems, calculators, and two-way car radios will rise as population and personal incomes grow. Government purchases for defense will continue to account for a large proportion of electronics manufacturing output. An increasing share of government purchases, however, is likely to be for electronic equipment used in medicine, education, pollution abatement, and other fields.

Although employment in the electronics industry is expected to grow over the long run, it may fluctuate from year to year, because of changes in economic activity and defense spending. As a result, job openings may be plentiful in some years, scarce in others.

The rates of employment growth will vary among occupational groups and individual occupations. For example, employment of skilled maintenance workers is expected to rise at a more rapid rate than total employment, because of the need to repair the increasing amounts of complex machinery. On the other hand, employment of assemblers probably will rise at a slower rate, because of the growing mechanization and automation of assembly line operations.

Employment of engineers, scientists, and technicians is expected to increase faster than total employment, because of continued high expenditures for research and development and the manufacture of more complex products. Among professional and technical workers, the greatest demand will be for engineers, particularly those who have a background in certain specialized fields, such as quantum mechanics, solid-state circuitry, product design, and industrial engineering. Many opportunities also will be available for engineers in sales departments because the industry's products will require sales personnel with highly technical backgrounds. The demand for mathematicians and physicists will be particularly good because of expanding research in computer and laser technology.

Earnings and Working Conditions

As shown in the accompanying table, in 1974 electronics production workers who made products for government and industrial use had higher average hourly earnings than production workers in manufacturing as a whole. Those making other electronic products, however, made less than the average for all manufacturing industries.

Type of product	*Production workers' average hourly earnings, 1974*
All manufacturing industries	$4.40
Major electronics manufacturing industries:	
Government and industrial electronics end products	4.66
Radio and television receiving sets, and phonographs	3.88
Electron tubes	4.33
Semiconductors and other components, except tubes	3.37

Working conditions in electronics manufacturing compare favorably with those in other industries. Plants are usually well-lighted, clean, and quiet. Many plants are relatively new, and are located in suburban and semirural areas. The work in most occupations is not strenuous but assembly-line jobs may be monotonous.

The injury rate in electronics manufacturing has been far below the average in manufacturing as a whole, and injuries usually have been less severe.

Many workers in electronics manufacturing are union members. The principal unions are the International Union of Electrical, Radio and Machine Workers; International Brotherhood of Electrical Workers; International Association of Machinists and Aerospace Workers; and the United Electrical, Radio and Machine Workers of America (Ind.).

Sources of Additional Information

Information about careers in this field can be obtained from the public relations departments of electronics manufacturing companies, the unions previously listed, and from:

Electronic Industries Association, 2001 Eye St. NW., Washington, D.C. 20006.

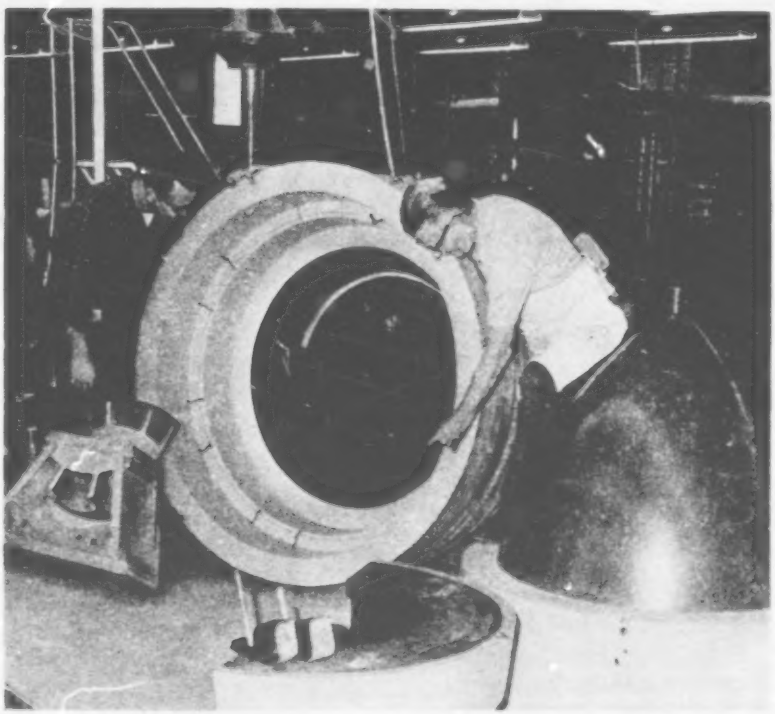
OCCUPATIONS IN FOUNDRIES

Metal castings produced by foundry workers are essential for thousands of products ranging from missiles to cooking utensils. In 1974, about 340,000 people worked in the foundry industry. Thousands of others worked in the foundry departments of plants which make and use castings in their final product, such as plants operated by manufacturers of automobiles or machinery.

Casting is a method of forming metal into intricate shapes. To cast metal, a mold is prepared with a cavity shaped like the object to be cast. Metal is then melted and poured into the mold to cool and solidify. The strength of metal which has been cast makes it suitable for many household and industrial items.

Nature and Location of the Foundry Industry

Nearly three-fourths of the foundry industry's employees work in iron and steel foundries. The remainder work in plants that cast nonferrous metals, such as aluminum, bronze, and zinc. Foundries usually specialize in a limited number of metals, because different methods and equipment are needed to melt and cast different alloys.



Foundry workers examine pattern for ship propeller cap.

There are six principal methods of casting, each named for the type of mold used. In the most common method, green-sand molding, a special sand is packed around a pattern in a boxlike container called a flask. After the pattern is withdrawn, molten metal is poured into the mold cavity and forms the desired metal shape. Sand molds can be used only once. A second method, called permanent molding, employs a metal mold that can be used many times. Permanent molding is used chiefly for casting nonferrous metals. Precision investment casting, a third method (often called the lost wax process), uses ceramic molds. A wax or plastic pattern is coated with refractory clay; after the coating hardens, the pattern is melted and drained so that a mold cavity is left. Castings produced from these molds are precise and require little machining. Shell molding, a fourth process, is becoming increasingly important. In this method, a heated metal pattern is covered with sand coated with resin. The sand forms a thin shell mold that, after curing, is stripped from the pattern. Castings produced from these molds are precise and have a smooth surface. Diecasting, a fifth process, is done mostly by machines. Molten metal under high pressure is forced into dies from which the castings are later automatically ejected or removed by hand. A sixth method, centrifugal casting, is used to make pipe and other products that have cylindrical cavities. Molten metal is poured into a spinning mold where centrifugal force distributes the metal against the walls of the mold.

Most foundries are small. More than 90 percent employ fewer than 250 workers, although several of the largest employ more than 5,000 workers.

Small foundries generally produce a variety of castings in small quantities. They employ hand and machine molders and coremakers (the key foundry occupations) and a substantial number

of unskilled laborers. Large foundries are often highly mechanized and produce great quantities of identical castings. These shops employ relatively few unskilled laborers, because cranes, conveyors, and other types of equipment replace manual labor in the moving of materials, molds, and castings. Since much of the casting in large shops is mechanized, they also employ proportionately fewer skilled molders and coremakers than small shops. However, many skilled maintenance workers, such as millwrights and electricians, are employed to service and repair the large amount of machinery.

Though foundries are located in many areas, jobs are concentrated in States which have considerable metalworking activity; for example, in Michigan, Ohio, Pennsylvania, Illinois, Indiana, and Wisconsin.

Foundry Occupations

Most of the industry's 340,000 employees in 1974 were plant workers. To illustrate more clearly the duties of these workers, a brief description of the jobs involved in the most common casting process—sand molding—follows:

After the casting is designed, the *patternmaker* (D.O.T. 600.280 and 661.281) makes a wood or metal pattern in the shape of the casting. Next, a *hand molder* (D.O.T. 518.381) makes sand molds by packing and ramming sand, specially prepared by a *sand mixer* (D.O.T. 579.782), around the pattern. A *molder's helper* (D.O.T. 519.887) may assist in these operations. If large numbers of identical castings are to be made, machines may be used to make the molds at a faster speed than is possible by hand. The operator of this equipment is called a *machine molder* (D.O.T. 518.782).

A *coremaker* (D.O.T. 518.381 and .885) shapes sand into cores (bodies of sand that make hollow spaces in castings). Most cores are baked in an oven by a *core-oven tender* (D.O.T. 518.887). After the cores are assembled, they are placed in the molds by *core setters* (D.O.T. 518.884) or molders. Now, the molds are ready for the molten metal.

A *furnace operator* (D.O.T. 512.782) controls the furnace that melts the metal which a *pourer* (D.O.T. 514.884) lets flow into molds. When the castings have solidified, a *shakeout worker* (D.O.T. 519.887) dumps them, and sends them to the cleaning and finishing department.

Dirty and rough surfaces of castings are cleaned and smoothed. A *shotblaster* (D.O.T. 503.887) operates a machine that cleans large castings by blasting them with air mixed with metal shot or grit. Smaller castings may be smoothed by tumbling. In this process, the castings, together with an abrasive material, are placed in a barrel which is rotated at a very fast speed. The person who controls the barrel is called a *tumbler operator* (D.O.T. 599.885). Sandblasters and tumbler operators may also operate a machine that both tumbles and blasts the castings. A *chipper* (D.O.T. 809.884) and a *grinder* (D.O.T. 809.884) use pneumatic chisels, powered abrasive wheels, powersaws, and handtools, such as chisels and files, to remove excess metal and to finish the castings.

Castings are frequently heat-treated in furnaces to strengthen the metal; a *heat treater*, or *annealer* (D.O.T. 504.782), operates these furnaces. Before the castings are packed for shipment, a *casting inspector* (D.O.T. 514.687) checks them to make sure they are structurally sound and meet specifications.

Many foundry workers are employed in occupations that are common to other industries. For example, maintenance mechanics, machinists, carpenters, and millwrights maintain and repair foundry equipment. Crane and derrick operators and truckdrivers move materials from place to place. Machine tool operators finish castings. Foundries also employ thousands of workers in unskilled jobs, such as guard, janitor, and laborer.

About one-sixth of all foundry workers are employed in professional, technical, administrative, clerical, and sales occupations. Of these personnel, the largest number are clerical workers, such as secretaries, typists, and accounting clerks.

Foundries employ engineers and metallurgists to do research, design machinery and plant layout, control the quality of castings, and supervise plant operations and maintenance. In recent years, many of these workers have been hired to sell castings and to assist customers in designing cast parts. Most foundry technicians are concerned with quality control. For example, they may test molding and coremaking sand, make chemical analyses of metal, and operate machines that test the strength and hardness of castings. Administrative workers employed in foundries include office managers, personnel workers, purchasing agents, and plant managers.

Detailed discussions of three principal foundry occupations—patternmakers, coremakers, and molders—appear elsewhere in the *Handbook*.

Training, Other Qualifications, and Advancement

Most workers start in unskilled jobs, such as laborer or helper, and, after receiving on-the-job training from a supervisor or experienced worker, gradually learn more skilled jobs. This is the usual practice in training workers for casting process jobs such as melter, chipper, and grinder.

Some skilled foundry workers—particularly hand molders, hand coremakers, and patternmakers—

learn their jobs through formal apprenticeship. Apprentices receive supervised on-the-job training for 2 to 4 years, usually supplemented by classroom instruction. High school graduates are preferred for apprenticeship programs, but applicants with less education sometimes are hired. Management prefers workers who have completed an apprenticeship, because they have a greater knowledge of all foundry operations and are therefore better qualified to fill supervisory jobs.

Skilled foundry workers also can learn their trades informally on the job or through a combination of trade school and on-the-job training. In some cases, trade school courses may be credited toward completion of formal apprenticeships. Some foundries and the American Foundry Society Cast Metals Institute conduct training programs to update and upgrade the skills of experienced workers.

Employment Outlook

Employment in the foundry industry is expected to show little or no change through the mid-1980's. Nevertheless, many job openings will become available because of the need to replace experienced workers who retire, die, or transfer to fields of work. The number of openings may fluctuate from year to year since the demand for foundry castings is sensitive to ups and downs in the economy.

Over the long run, population growth and higher incomes will create a demand for more automobiles, household appliances, and other consumer products that have cast parts. More castings also will be needed for industrial machinery as factories expand and modernize. However, technological developments will enable foundries to meet the increased demand for castings without increasing employment significantly. Continued improvements in production methods will result in greater output per worker.

Although foundry employment as a whole is not expected to change significantly through the mid-1980's, employment will rise in some occupations. For example, employment of scientists and engineers is expected to increase because of expanding research and development activities. Technicians also will be needed in greater numbers to help improve quality control and production techniques. More maintenance workers will be hired to keep the industry's growing amount of machinery in working order. In contrast, machine molding and coremaking will be substituted for hand processes, and will limit the need for additional hand molders and hand coremakers. Improved molding techniques, such as quick set molding in which the mold hardens quickly and without baking in an oven, also will limit employment of molders. As more machinery for materials handling is introduced, employment of laborers and other unskilled workers may decline.

Earnings and Working Conditions

Production workers in foundries have higher average earnings than those in manufacturing as a whole. In 1974, production workers in iron and steel foundries averaged $5.05 an hour, and those in nonferrous foundries averaged $4.48. By comparison, production workers in all manufacturing industries averaged $4.40 an hour.

Working conditions in foundries have improved in recent years. Many foundries have changed plant layouts and installed modern ventilating systems to reduce heat, fumes, and smoke. Although the injury rate in foundries is higher than the average for manufacturing, employers and unions are attempting to reduce injuries by promoting safety training.

Foundry workers belong to many unions, including the International Molders' and Allied Workers' Union; the United Steelworkers of America; and the International Union of Electrical, Radio and Machine Workers. Many patternmakers are members of the Pattern Makers' League of North America.

Sources of Additional Information

Further information about work opportunities in foundry occupations may be obtained from local foundries, the local office of the State employment service, the nearest office of the State apprenticeship agency or the Bureau of Apprenticeship and Training, U.S. Department of Labor. Information also is available from the following organizations:

American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill. 60016.

Cast Metals Federation, Cast Metals Federation Building, 20611 Center Ridge Rd., Rocky River, Ohio 44116.

Foundry Educational Foundation, 1138 Terminal Tower, Cleveland, Ohio 44113.

International Molders' and Allied Workers' Union, 1225 E. McMillan St., Cincinnati, Ohio 45206.

OCCUPATIONS IN THE INDUSTRIAL CHEMICAL INDUSTRY

Industrial chemical products are the raw materials for all kinds of everyday items, from nylon stockings to automobile tires. Chemicals also are used to treat drinking water, to propel rockets, and to make steel, glass, explosives, and thousands of other items. The discovery of nylon, plastics, and other new products has helped the industrial chemical industry become one of the Nation's most important.

Making these many, very different kinds of products requires a large number of workers with many different skills. About 550,000 people in many different occupations worked in the industrial chemical industry in 1974. Training varies from a few days on the job for some plantworkers to college degrees for engineers and chemists.

Nature of the Industry

The industry produces organic and inorganic chemicals, plastics, and man-made rubber and fibers. Unlike drugs, paints, and other chemical products sold directly to consumers, industrial chemicals are used by other industries to make their own products.

Chemical products are made from coal, petroleum, limestone, mineral ores, and many other raw materials. Since these materials usually go through several chemical changes, the finished products are vastly different from the original ingredients. Some plastics, for example, are made from natural gas.

In a modern chemical plant, automatic equipment controls the dissolving, heating, cooling, mixing, filtering, and drying processes that convert raw materials to finished products. This equipment regulates the combination of ingredients, flow of materials, and the temperature, pressure, and process time. Materials also are moved automatically from one part of the plant to another by conveyors or through pipes. Because of this automatic equipment, relatively few workers can produce tons of chemicals in one continuous operation.

About two-thirds of the 3,000 industrial chemical plants in the United States have fewer than 50 workers. Over half of the industry's employees, however, are concentrated in large plants with more than 500 workers.

Chemical plants are usually close to manufacturing centers or near the sources of raw material. Many plants that produce chemicals from petroleum, for example, are near the oil fields of Texas and Louisiana. Although industrial chemical workers are employed in almost every state, about half of them work in Tennessee, New Jersey, Texas, Virginia, West Virginia, Ohio, and South Carolina.

Occupations in the Industry

Workers with many different skills and levels of education work in the industrial chemical industry. Research scientists, engineers, and technicians develop products and design equipment and production processes. Administrators, professionals, and clerical workers handle financial and business matters, keep records, and advertise and sell chemical products. Other employees are in processing, maintenance, and other plant jobs.

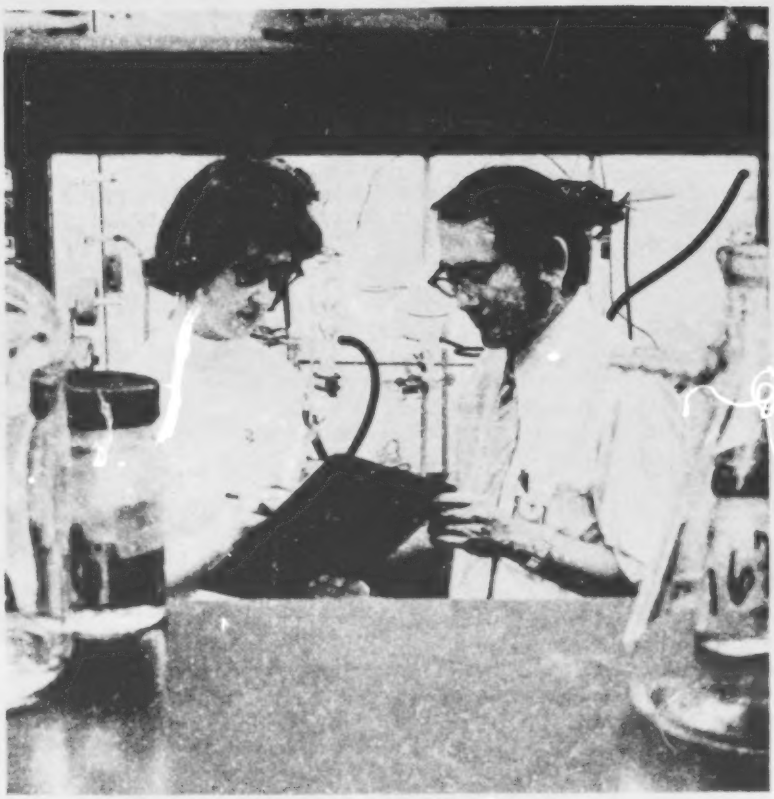
Scientific and Technical Occupations. The industrial chemical industry is one of the Nation's major employers of scientific and technical workers; 1 out of 5 of its employees is a scientist, engineer, or technician. Many work in research and testing laboratories. An even larger number are administrators or production supervisors. Because the sale of chemical products frequently requires a technical background, scientists and engineers sometimes work as sales representatives.

Chemists are the largest and one of the most important group of scientists in the industry. Through basic and applied research, chemists learn about the properties of chemicals in order to find new and improved products and production methods. Their efforts have led to the discovery of plastics, nylon, and many other items.

Chemists also work in activities other than research and development. A large number supervise plantworkers or analyze and test chemical samples to insure the quality of the final product. Others are administrators, marketing experts, chemical salesworkers, and technical writers.

Engineers are another important group of industrial chemical professionals. Using their knowledge of both chemistry and engineering, chemical engineers convert laboratory processes into large-scale production methods. They design chemical plants and processing equipment and sometimes supervise construction and operation. Chemical engineers also fill sales, customer service, market research, plant management, and technical writing jobs.

Mechanical engineers design power and heating equipment. They also work with chemical engineers to design processing equipment and supervise its installation,



One out of five chemical workers is a scientist, engineer, or technician.

operation, and maintenance. Electrical engineers design electric and electronic instruments and control devices, and facilities for generating and distributing electric power.

Many technical workers assist scientists and engineers. Laboratory technicians conduct tests and record the results in charts, graphs, and reports which are used by chemists and chemical engineers. Their work may range from simple routine tests to complicated analyses. Drafters provide engineers with specifications and detailed drawings of chemical equipment.

Plant Occupations. About 3 out of every 5 industrial chemical workers operate or maintain equipment or do other plant jobs.

Skilled *chemical operators* (D.O.T. 558.885 and 559.782) and their helpers are the largest group of plantworkers. They set dials, valves, and other controls on automatic equipment to insure that the right temperature, pressure, and amounts of materials are used. As chemicals are processed, operators read instruments that measure pressure, flow of materials, and other conditions. They also use instruments to test chemicals or send chemical samples to the testing laboratory. Operators keep records of instrument readings and test results and report equipment breakdowns. Chemical operators are sometimes called filterers, mixers, or some other title, depending on the kinds of equipment they operate.

To keep production processes running smoothly, instruments must give accurate measurements and equipment must withstand corrosion, damaging chemicals, high temperatures, and pressure. Many skilled maintenance workers are needed to keep this equipment in good condition. Pipefitters and boilermakers lay out, install, and repair pipes, vats, and pressure tanks; maintenance machinists make and repair metal parts for machinery; electricians maintain and repair wiring, motors, and other electrical equipment; and instrument repairers install and service instruments and control devices. In some chemical plants one worker may do several of these jobs. Plantworkers also are needed to drive trucks, keep inventory of stock and tools, load and unload trucks, ships, and railroad cars, keep the plant and office clean, and do many other kinds of work.

Administrative, Clerical, and Related Occupations. About 1 out of 5 industrial chemical workers holds an administrative, clerical, or other nonscientific white-collar job. High-level managers generally are

Chemical operator checks production process.

trained in chemistry or chemical engineering. These executives decide what products to manufacture, where to build plants, and how to handle the company's finances. Executives depend on specialized workers including accountants, sales representatives, lawyers, industrial and public relations workers, market researchers, computer programmers, and personnel and advertising workers. Many secretaries, typists, payroll and shipping clerks, and other clerical employees work in offices and plants.

(Individual statements elsewhere in the *Handbook* give detailed discussions of many scientific, technical, maintenance, and other occupations found in the industrial chemical industry, as well as in other industries.)

Training, Other Qualifications, and Advancement

Jobs in the industrial chemical industry require from a few days of on-the-job training to many years of preparation. Some plant workers can learn their jobs in a day or two. Scientists, engineers, technicians, and chemical operators, on the other hand, spend several years learning their skills.

Engineers and scientists must have at least a bachelor's degree in engineering, chemistry, or a related science. Most research jobs, however, require advanced degrees or specialized experience. Many scientists and engineers attend graduate courses at company expense.

Some firms have formal training programs for newly hired scientists and engineers. Before they are assigned to a particular job, these employees work briefly in various departments to learn about the company's overall operation. In other firms, junior scientists and engineers are assigned immediately to a specific job.

Technicians qualify for their jobs in many ways. Graduates of technical institutes, junior colleges, or vocational technical schools have the best opportunities. Companies also hire students who have completed part of the requirements for a college degree, especially if they have studied mathematics, science, or engineering. High school graduates with courses in chemistry can qualify through on-the-job training and experience. Many technicians receive additional technical school or undergraduate training through company tuition-refund programs.

Laboratory technicians usually start as trainees or assistants, and drafters begin as copyists or tracers. As they gain experience and show ability to work without close supervision, these technicians advance from routine work to more difficult and responsible jobs.

Industrial chemical firms generally hire and train inexperienced high school graduates for processing and maintenance jobs. Equipment operators and other processing workers usually start out in a labor pool where they are assigned jobs such as filling barrels or moving materials. Workers may be transferred from the labor pool to fill vacancies in one of the processing departments. As they gain experience they move to more skilled processing jobs. Thus, a worker may advance from laborer to chemical operator helper, and then to chemical operator. Skilled processing workers are rarely recruited from other plants.

Most maintenance workers are trained on the job. Chemical companies often have formal maintenance training programs, including some classroom instruction, which may last from a few months to several years. Instrument repairers sometimes attend training programs offered by instrument manufacturers. Maintenance workers and trainees are encouraged to take job-related courses at local vocational or technical schools. Their employers may pay part or all of the tuition.

Administrative jobs are usually filled by people with college degrees in business administration, accounting, economics, statistics, marketing, industrial relations, and other fields. Chemists and engineers also hold administrative jobs. Some companies have advanced training programs for new administrative employees.

Secretaries, bookkeepers, and other clerical workers generally have had commercial courses in high school or business school.

Employment Outlook

The outlook for the industrial chemical industry through the mid-1980's is uncertain. Large increases in the price of petroleum, which is the raw material for many industrial chemicals, have brought about rapid increases in the prices of these products. Higher prices eventually may curtail the demand for chemicals, subsequently moderating the industry's production growth. This development could sharply reduce the employment growth that otherwise would occur. However, even if employment does not grow, the industry will still need many new workers to replace employees who retire, die, or transfer to other industries. Job openings from deaths and retirements alone will average several thousand a year.

Although the composition of employment in the industry is expected to change, with more administrative and technical workers needed to handle the increasingly complex production processes, most job openings will continue to be for production workers since they are the largest group of employees.

Earnings and Working Conditions

Production workers in the industrial chemical industry have relatively high earnings because a large

proportion of them are in skilled jobs. In 1974 they averaged $5.05 an hour, compared to $4.40 an hour for production workers in all manufacturing.

National wage data are not available for individual occupations in the industrial chemicals industry. However, in 1974 hourly wages in a few union-management contracts were as follows:

	Hourly rates
Instrument repairers	$4.13–6.00
Laboratory technicians	3.93–5.89
Chemical operators	4.13–5.86
Pipefitters, boilermakers, and sheet-metal workers	4.13–5.86

Because chemical plants usually operate around the clock—three shifts a day, 7 days a week—processing workers often work the second or third shift, usually for extra pay. Shift assignments are usually rotated, so an individual may work days 1 week and nights the next. Maintenance workers usually work only the day shift.

Most industrial chemical jobs, except those for laborers or material handlers, are not strenuous. Equipment operators are on their feet most of the time. Some workers must climb stairs or ladders to considerable heights, or work outdoors in all kinds of weather. Workers may be exposed to dust, disagreeable odors, or high temperatures, although most plants have ventilating or air-conditioning systems.

Many chemicals are dangerous to touch or breathe. However, the industrial chemical industry has one of the better safety records in manufacturing. Protective clothing, eyeglasses, showers, and eye baths near hazardous work stations and other safety measures help prevent serious injuries.

Many production workers in the industrial chemical industry belong to labor unions, including the International Chemical Workers Union; Oil, Chemical, and Atomic Workers International Union; and the United Steelworkers of America.

Sources of Additional Information

Further information on careers in the industry may be obtained from employment offices of industrial chemical companies, locals of the unions mentioned above, and from:

American Chemical Society, 1155 16th St. NW., Washington, D.C. 20036.

Manufacturing Chemists' Association, Inc., 1825 Connecticut Ave. NW., Washington, D.C. 20009.

OCCUPATIONS IN THE IRON AND STEEL INDUSTRY

Steel is the backbone of any industrialized economy. Few products in daily use have not been made from steel or processed by machinery made of steel. In 1974, the United States produced about one-fifth of the world's steel output.

About 610,000 wage and salary workers were on the payrolls of the iron and steel industry's more than 940 plants in 1974. Employees work in a broad range of jobs that require a wide variety of skills. Many of these jobs are found only in iron and steelmaking.

The iron and steel industry, as discussed in this chapter, consists of blast furnaces, steelmaking furnaces, and finishing mills. The mining and processing of raw materials used to make steel and the fabrication of steel are not described. (Employment opportunities in foundry, forging, and machining occupations are discussed elsewhere in the *Handbook*.)

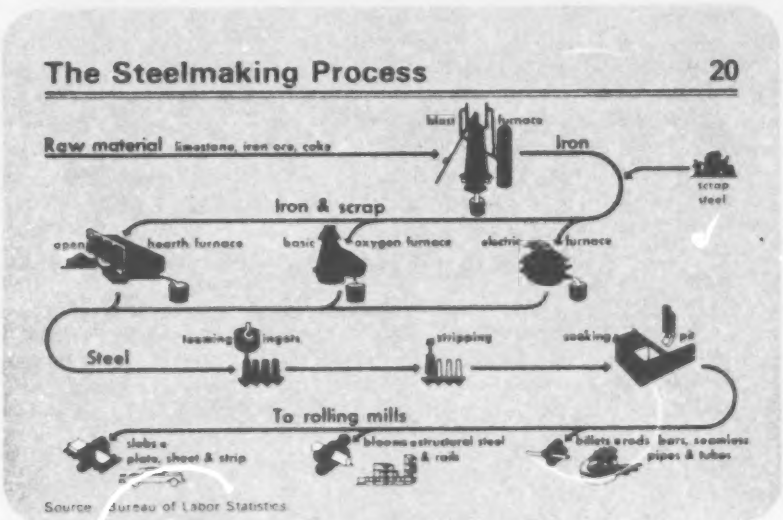
Blast furnaces make iron from iron ore, coke, and limestone. Steelmaking furnaces refine the iron into steel. Primary rolling mills and continous casting operations shape the steel into basic products called billets, blooms, and slabs, which other rolling mills refine into sheets, plates, bars, strips, and various other semifinished products. Many mills also produce finished items, such as pipe and wire. Most semifinished steel products, however, are shipped to plants of other industries.

The leading steel-consuming industries manufacture automobiles, construction materials, machinery and machine tools, containers, and household appliances. Steel sheets are made into automobile bodies, appliances, and furniture. Steel bars are used to make parts for machinery and to reinforce concrete in building and highway construction. Steelplates become parts of ships, bridges, railroad cars, and storage tanks. Strip steel is used to make pots and pans, razor blades, toys, and many other items.

Individual plants in the iron and steel industry typically employ a large number of workers. About 80 percent of the industry's employees work in plants which have more than 2,500 employees. A few plants have more than 20,000. Many plants, however, have fewer than 100 employees.

Iron and steel plants are located mainly in the northern and eastern parts of the United States. About 7 out of 10 of the industry's workers are employed in five States—Pennsylvania, Ohio, Indiana, Illinois, and New York. Nearly 3 out of 10 are employed in Pennsylvania alone.

The heart of U.S. steel manufacturing is a triangular area, about 250 miles on a side, marked off by Johnstown, Pa., Buffalo, N.Y., and Detroit, Mich. Included in this area are major steel producing centers such as Pittsburgh, Pa., and Cleveland and Youngstown, Ohio. Large plants also are located on the south shore of Lake Michigan near Chicago. The Nation's three largest steel plants are located at Indiana Harbor and Gary, Ind., and Sparrows Point, Md. (near Baltimore). Much of the steelmaking in the South is in the vicinity of Birmingham, Ala., and Houston, Tex. In California there are plants at Fontana and near San Francisco. Other steelmaking facilities are located at Pueblo, Colo. and Provo, Utah.



Occupations in the Industry

Workers in the iron and steel industry hold more than 2,000 different types of jobs. Many are directly engaged in making iron and steel and converting it into

semifinished and finished products. Others maintain the vast amount of machinery used in the industry, operate cranes and other equipment that move raw materials and steel products about the plants, or perform other kinds of production jobs. In addition, many workers are needed to do clerical, sales, professional, technical, administrative, and supervisory work.

Processing Occupations. The majority of the workers in the industry are employed in the many processing operations involved in converting iron ore into steel and then into semifinished and finished steel products. Following are brief descriptions of the major steelmaking and finishing operations and some of the occupations connected with them.

Blast furnaces. The blast furnace, a large steel cylinder lined with heat-resistant brick, is used to make molten iron from iron ore. A mixture of ore, coke, and limestone (called a "charge") is fed into the top of the furnace. Hot air blown in the bottom from giant stoves causes the coke to burn, producing intense heat. At these high temperatures gas from the burning coke reacts with the oxygen in the ore, freeing the iron.

The iron, now molten, trickles down through the burning coke and collects in a pool at the bottom of the furnace. At the same time, the intense heat causes the limestone to combine with other impurities in the ore and with coke ash to form "slag," a byproduct that is often used for making cement and insulating materials. The slag also trickles down through the coke and floats on top of the heavier molten iron. Molten iron is removed from the furnace every 3 or 4 hours; slag may be removed more frequently.

A blast furnace operates continuously, 24 hours a day, 7 days a week, unless it is shut down for repairs or for other reasons. A single furnace may produce up to 7,500 tons of iron in a 24-hour period.

The raw materials used in blast furnaces are transferred from stockyards by *larry operators* (D.O.T. 919.883). These workers position their larry cars under storage bins where they are filled with coke, limestone, or iron ore. After driving on tracks to the furnace, the operators position their cars over an open grate. Pulling a lever, they dump the materials through the grate and into a hopper. *Scale car operators* (D.O.T. 921.883) drive other larry cars on tracks in tunnels underneath the hoppers. Positioning their car under one of these bins, they fill it with raw material, weigh the loaded car, and then unload the material into skip cars where the ore, limestone, or coke is automatically carried to the top of the blast furnace and dumped. In stockhouses without automatic controls a *skip car operator* (D.O.T. 921.883) uses electric and pneumatic controls to operate these cars. Scale car operators must keep records of what they put in the furnace, and must know what is in the furnace at any time. *Stove tenders* (D.O.T. 512.782) operate the stoves which heat air for the blast furnace. They regulate valves to control the heat of the stoves and the flow of air to the furnace.

Blowers (D.O.T. 519.132) oversee the operation of one or more blast furnaces and are responsible for the quantity and quality of the iron produced. They coordinate the addition of raw materials by stockhouse workers with the furnace operation and supervise *keepers* (D.O.T. 502.884) and their *helpers* (D.O.T. 502.887) in removing (tapping) the iron and slag from the furnace. If the iron is not forming correctly in the furnace, they may have the stove tenders change the temperature and flow of air into the furnace.

When the blower has determined that the iron is ready to be removed, the keeper and a helper drill through the clay that is plugging a taphole above the molten iron, allowing the slag to flow down a sand-lined channel into waiting ladles. Helpers open gates to divert the slag into other ladles when the first one is filled. After removing the slag the keeper drills through a lower taphole which allows the iron to flow down another channel into hot metal cars. In some furnaces only the lower taphole is used. The slag flows out after the iron and is diverted by the keeper to the slag channel. To close the furnace the keeper uses a "mud gun" to shoot clay into the tapholes. The keeper and helpers use sledges and tongs to remove solidified iron and slag from the channels and shovels to line the channels with special heat resistant sand.

Some iron is made into finished products such as automobile engine blocks and plumbing pipes. Most of it, however, is used to make steel. Because steel is stronger than iron and can be hammered and bent without breaking, it can be used for many more products.

Steel furnaces. Steel is made by refining iron to remove some of the carbon and impurities and adding alloying agents such as silicon and manganese. This is done in several types of furnaces: basic oxygen, open hearth, and electric.

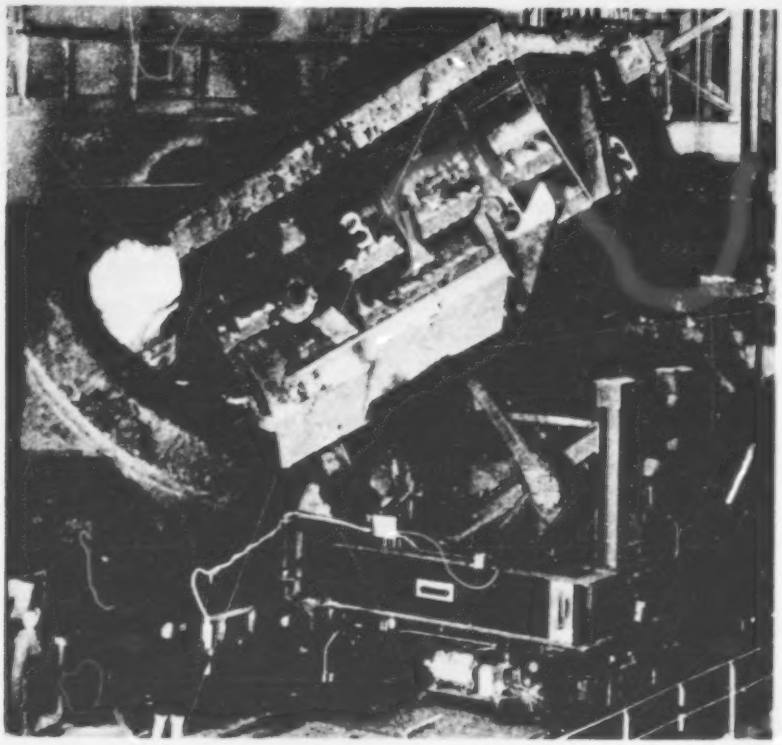
More than half of all domestic steel is made in basic oxygen furnaces (BOF's) and about a quarter in open hearth furnaces. Both produce similar kinds of steel, but BOF's do the job faster and are expected to replace many of the open hearths now in operation. Although electric furnaces also produce regular steel like that made by BOF's and open hearths, they can also produce high quality steel such as tool and stainless steel.

A *melter* (D.O.T. 512.132) supervises workers at a steel furnace. Melters receive information on the characteristics of the raw materials they will be using and the type and

quality of steel they are expected to produce. The melter makes the steel to the desired specifications by varying the proportions of iron, scrap steel, and limestone in the furnace, and by adding small amounts of other materials such as manganese, silicon, copper, or other alloy additives. The procedure followed depends on the furnace used.

A basic oxygen furnace (BOF) is a giant, pear-shaped steel container lined with refractory material. The *furnace operator* (D.O.T. 512.782), under the direction of the melter, controls this steelmaking process. To begin the operation, the furnace operator's first assistant uses controls to tilt the furnace to receive the charge of steel scrap and molten iron. A *scrap crane operator* (D.O.T. 921.883) adds scrap steel and is followed by a *charging crane operator* (D.O.T. 921.883) who adds the molten iron made by the blast furnace. After the assistant rights the furnace, the furnace operator, who works in a pulpit, uses levers and buttons to lower the oxygen lance, a pipe which blows oxygen into the furnace at supersonic speeds. Operators also control the addition of lime, which reacts with impurities in the iron to form slag, and the addition of any alloys which are required to give the steel the desired properties. If the chemical reactions become too violent, the furnace may overheat, causing slag and iron to splash out the top. Thus, furnace operators must pay close attention to conditions in the furnace, regulate the oxygen flow and, if the furnace does overheat, direct the rocking of the furnace to cool it.

By observing the various instruments in the control room, the furnace operator knows when the steel has almost the correct composition. The first assistant then tilts the furnace while the second assistant and helpers, working from behind a heat shield, use a long-handled spoon to take a sample. The sample is sent up to the lab where metallurgists determine how close the steel is to the product desired. Based on this information, the furnace operator determines how much longer and at what temperature the furnace should operate. When the furnace operator has determined that the steel is of the correct composition, the first assistant tilts the furnace towards a waiting ladle. The steel flows through a taphole halfway up the furnace and into the ladle. The second assistant and helpers may add alloys to the ladle while the steel is poured. By continually tilting the furnace at a steeper angle the first assistant can keep the slag above the taphole, preventing it from flowing into the ladle. Eventually, the slag is poured into the slag pot. The assistants and helpers then use handtools to clean out the tap hole and furnace lip.



A scrap crane operator loads a B.O.F. with scrap metal.

An open hearth furnace resembles a large, rectangular, shallow pan. The melter at this furnace supervises a *first helper* (D.O.T. 512.782) who in turn directs the activities of a *second helper* (D.O.T. 502.884) and a *third helper* (D.O.T. 519.887). To begin the operation, a *charging-machine operator* (D.O.T. 512.883), working in a pulpit, uses a long-armed charging machine to dump boxes of limestone and scrap steel inside the furnace door. The first helper operates controls to open and close the door, and regulates the flow of hot air from brick stoves to the furnace. After determining that the material has reached the correct temperature, the first helper signals a crane operator who pours molten iron from a ladle into a movable spout located at a door of the furnace. The first helper continues to operate controls to bring the furnace up to the best temperature for the steelmaking reactions.

After taking a sample of the molten metal and determining that it

has the correct composition, the first helper directs the other helpers in tapping the furnace. Using an explosive charge, the second helper opens the taphole, which is located at the lowest part of the furnace. While the metal flows into the ladle, the second and third helpers shovel alloying materials, which they had previously weighed and wheeled to the furnace, into the ladle. The lighter slag flows out after the steel and overflows into a slag pot. After the furnace has been emptied, the first helper examines the interior and supervises the other helpers in repairing any damage to the floor or walls.

The electric arc furnace is the most common electric furnace. To load it, the roof is usually swung aside by the *furnace operator* (D.O.T. 512.782). A crane operator adds lime, scrap steel, and in some cases enriched iron pellets to the furnace. Molten iron is seldom used in these furnaces. After closing the roof, the furnace operator uses controls to lower electrodes to within a few inches of the metal. Other controls are used to regulate the current flowing through the electrodes. The current arcs from an electrode to the metal and then back to a neighboring electrode, melting the steel. By regulating the current, the operator can control the temperature much more accurately than operators of BOF's and open hearths, to produce very high quality steels.

To remove the slag, the furnace operator uses levers to tilt the furnace slightly while an assistant uses a long pole to stir the slag. This helps the slag flow out of a spout located above the molten steel. When the furnace has been righted, alloys can be added through the roof, after which the operator tilts the furnace in the opposite direction to pour the steel into a ladle.

Molten steel usually is solidified into large blocks called "ingots." A *ladle crane operator* (D.O.T. 921.883) controls an overhead crane which picks up the ladle of molten steel and moves it over a long row of ingot molds resting on flatbottom cars. The *steel pourer* (D.O.T. 514.884) operates a stopper at the bottom of the ladle to let the steel flow into these molds. As soon as the steel has solidified sufficiently, an *ingot stripper* (D.O.T. 921.883) operates an overhead crane, which removes the molds from the ingots.

Furnace workers take sample of molten steel for laboratory analysis.

Rolling and finishing. The three principal methods of shaping steel are rolling, casting, and forging. About three-fourths of all steel products are shaped by the rolling process. In this method, heated steel ingots are squeezed into longer and flatter shapes between two massive cylinders or "rolls." Before ingots of steel are rolled, they are heated to the temperature specified by plant metallurgists. The heating is done in large furnaces called "soaking pits," located in the plant floor. A *soaking pit crane operator* (D.O.T. 921.883) maneuvers an overhead crane to lift the ingots from small railcars and place them in the soaking pit. A *heater* (D.O.T. 613.782) and *helper* (D.O.T. 613.885) control the soaking pit operation. They adjust controls to maintain the correct temperature in each pit, and by watching dials and observing the color of the metal, they determine when the ingot is ready for rolling. When the ingots are hot enough the crane operator places them on an ingot buggy, which carries them to the first rolling mill, sometimes called a "primary" mill. Here, the ingots are rolled into smaller, more easily handled shapes called blooms and slabs. Blooms are generally between 6 and 12 inches wide and 6

and 12 inches thick. Slabs are much wider and thinner than blooms.

The rolling of ingots into blooms and slabs is a similar operation; in fact some rolling mills can do both. The ingot moves along on a roller conveyer to a machine which resembles a giant clothes wringer. A "two-high" rolling mill has two grooved rolls which revolve in opposite directions. The rolls grip the approaching ingot and pull it between them, squeezing it thinner and longer. When the ingot has made one such pass the rolls are reversed, and the ingot is fed back through them. Throughout the rolling operation, the ingot is periodically turned 90 degrees by mechanical devices called "manipulators," and passed between the rolls again so that all sides are rolled. This operation is repeated until the ingot is reduced to a slab or bloom of the desired size. It is then ready to be cut to specified lengths.

A *roller* (D.O.T. 613.782), the worker in charge of the mill, works in a glass-enclosed control booth, located above or beside the conveyer line. This employee's duties, which appear to consist principally of moving levers and pushing buttons, look relatively simple. However, the quality of the product and the speed with which the ingot is rolled depend upon the roller's skill. The roller regulates the opening between the rolls after each pass. If the opening is set too wide, more passes will be needed to get the required shape, and production will be slowed. If the opening is too narrow, the rolls or gears may be damaged. Long experience and a knowledge of steel characteristics are required for a worker to become a roller. A *manipulator operator* (D.O.T. 613.782) sits in the booth beside the roller and operates controls which position the ingot correctly before each pass.

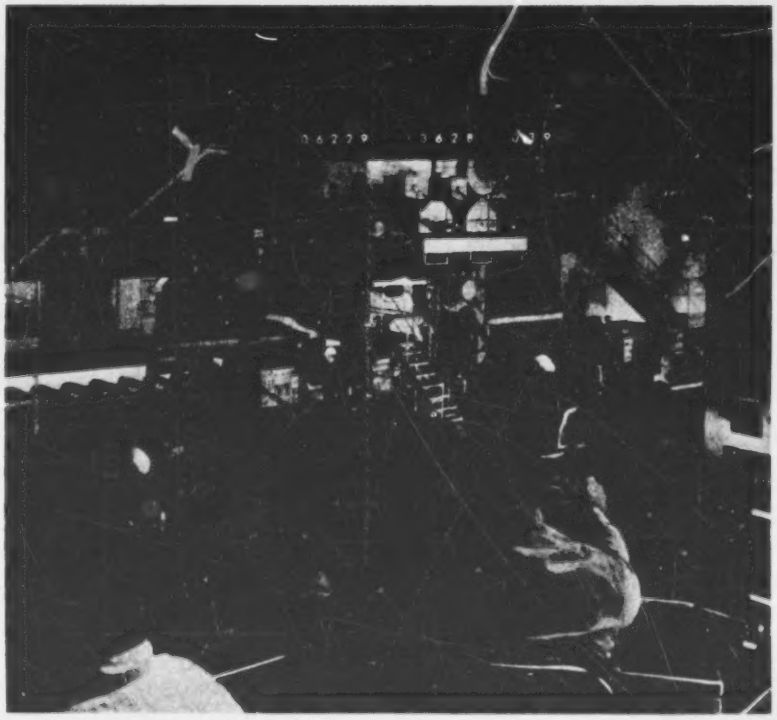
Upon leaving the rolling mill, the red-hot slab or bloom moves along a conveyer to a place where a *shear operator* (D.O.T. 615.782) controls a heavy hydraulic shear which cuts the steel into desired lengths.

In a rolling mill that has automatic controls, a rolling mill attendant is given a card that has been punched with a series of holes. The holes represent coded directions as to how the ingot is to be rolled. The attendant inserts the card into a card "reader" and presses a button to start the automatic rolling sequence. When this process is used, the roller's job is shifted from operating the controls to directing and coordinating the rolling process.

Of increasing use in steel shaping is the continuous casting process, which eliminates the necessity of producing large ingots that in turn must be reheated and then put through huge blooming and slabbing mills. In the continuous casting process, molten steel is poured into a water-cooled mold having the profile of the desired product shape, such as slab or bloom. The steel cools and solidifies along the bottom and lower sides of the mold. Passing down through a chamber, the steel is further cooled by a water spray. Pinch rolls control its descent and support its weight, and the molded slab or bloom of steel is cut into lengths as it emerges from the rolls.

After the steel is rolled or cast into primary shapes, most of it is put through semifinishing and finishing operations. Slabs, for example, can be reduced and shaped into plates and sheets. Blooms can be made into rods which in turn can be reduced to wire.

To make sheets, a slab is first heated in a furnace similar to the soaking pits, described earlier, and then run through a hot strip mill. The hot strip mill is a continuous series of pairs of rolls, similar to the two at the primary mill. As the slab moves through each pair of rolls it



Remote control enables rollers to work outside the vicinity of the rolling process.

becomes thinner and longer. Edge guides control its width. After passing through the last pair of rolls, the sheet is wound into a coil. If the customer prefers a thinner sheet or an improved surface, the product may be cold rolled in another mill.

Having obtained information on the characteristics of the sheet desired, the roller at the hot strip mill refers to a printed guide to determine the necessary gauge between each pair of rolls, and the speed at which the slab should travel. Working in a pulpit, the roller uses controls to set the gauge on the last series of rolls, while the *speed operator* (D.O.T. 613.782) controls the speed of the sheet being rolled. Unless problems develop, the job of these two workers is repetitive. However, if the sheet should begin to buckle between rolls, due to the steel's composition or temperature, these two employees must readjust the gauge and speed in an attempt to avoid damage to the sheet.

Under the direction of the roller, a *rougher* (D.O.T. 613.782) and assistant use handtools to adjust the gauge and edge guides for the first series of rolls (called the roughing mill). A *rougher pulpit operator* (D.O.T. 613.782), following the rougher's instructions, signals the furnace crew for additional slabs and uses hand controls to operate guides to position the slab at the start of the run.

Wire and pipe are made from blooms. First the bloom is rolled into a billet (a bloom with a smaller cross section). To make wire, the billet is rolled into an even thinner product called a rod.

A *wire drawer* (D.O.T. 614.782) operates equipment that pulls the steel rod through a die. The die has a tapered hole, one end of which is smaller than the rod. As the rod passes through the hole, it is made thinner and longer and becomes wire.

A *piercer-machine operator* (D.O.T. 613.885) controls machinery that makes seamless pipe from solid billets of steel. The operator passes a heated billet between two barrel-shaped rolls which spin the billet and force an end of it against a sharp plug or "mandrel." The mandrel smooths the inside wall of the billet and makes the diameter of the hole uniform.

Maintenance, Transportation, and Plant Service Occupations. Large numbers of workers are required in steel plants to support processing activities. Some maintain and repair machinery and equipment, while others operate the equipment which provides power, steam, and water.

Machinists and machine tool operators make and repair metal parts for production equipment. Diemakers use machine tools to form dies, such as those used to make wire. *Roll turners* (D.O.T. 613.780) use lathes, grinders, and other machine tools to refinish the steel rolls used in the rolling mills.

Millwrights overhaul machinery and repair and replace defective parts. Electricians install wiring and fixtures and hook up electrically operated equipment. Electrical repairers (motor inspectors) keep wiring, motors, switches, and other electrical equipment in good operating condition.

Electronic repairers install and maintain the increasing number of electronic devices and systems used in steel manufacturing plants. Typically, this equipment includes communication systems such as closed-circuit television; electronic computing and data recording systems; and measuring, processing, and control devices such as X-ray measuring or inspection equipment.

Bricklayers repair and rebuild the brickwork in furnaces, soaking pits, ladles, and coke ovens, as well as mill buildings and offices. Pipefitters lay out, install, and repair piping that is used to carry the large amounts of liquids and gases used in steelmaking. Boilermakers test, repair, and rebuild heating units, storage tanks, stationary boilers, and condensers. Locomotive engineers and other train crew members operate trains that transport materials and products in the vast yards of iron and steel plants. Other skilled workers operate the various boilers, turbines, and switchboards in factory powerplants.

Other types of maintenance and service workers include carpenters, oilers, painters, instrument repairers, scale mechanics, welders, loaders, riggers, janitors, and guards. Many laborers are employed to load and unload materials and do a variety of cleanup jobs.

Administrative, Clerical, and Technical Occupations. Professional, administrative, clerical, and salesworkers consitute about one-fifth of the industry's total employment. Of these, the majority are clerical workers, such as secretaries, stenographers, typists, accounting clerks, and general office clerks.

Engineers, scientists, and technicians make up a substantial proportion of the industry's white-collar employment. Several thousand of these workers perform research and development work to improve existing iron and steel products and processes, and to develop new ones.

Among the technical specialists employed in steelmaking are mechanical engineers, whose principal work is the design, construction, and operation of mill machinery and material handling equipment. Metallurgists and metallurgical engineers work in laboratories and production departments where they have the important task of specifying, controlling, and testing the quality of the steel during its manufacture. Civil engineers are engaged in the layout, construction, and maintenance of steel plants, and the equipment used for heat, light, and transportation. Electrical engineers design, lay out, and su-

pervise the operation of electrical facilities that provide power for steel mill operation.

Chemists analyze the chemical properties of steel and raw materials in laboratories. Laboratory technicians do routine testing and assist chemists and engineers. Drafters prepare working plans and detailed drawings required in plant construction and maintenance.

Among the employees in administrative, managerial, and supervisory occupations are office managers, labor relations and personnel managers, purchasing agents, plant managers, and industrial engineers. Working with these personnel are several thousand professional workers, including accountants, nurses, lawyers, economists, statisticians, and mathematicians. The industry also employs several thousand salesworkers.

(Detailed discussions of professional, technical, mechanical, and other occupations found in the iron and steel industry, as well as in many other industries, are given elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

New workers in processing operations usually are hired as unskilled laborers. Openings in higher rated jobs usually are filled by promoting workers from lower grade jobs. Length of service with the company is the major factor considered when selecting workers for promotion. Promotions to first level supervisory positions, such as blower and melter, differ among companies. Some firms determine these promotions solely on seniority while others base them on ability to do the job.

Training for processing occupations is done almost entirely on the job. Workers move to operations requiring progressively greater skill as they acquire experience. A crane operator, for example, first is taught how to operate relatively simple cranes, and then advances through several steps to cranes much more difficult to run, such as the hot-metal crane.

Workers in the various operating units usually advance along fairly well-defined lines of promotion within their departments. For example, to become a blast furnace blower, a worker generally starts as a laborer, advancing to second helper, first helper, keeper and finally blower. At a basic oxygen furnace a worker may begin by doing general cleanup work and then advance to furnace hand, second assistant, first assistant, furnace operator and eventually to melter. A possible line of job advancement for a roller in a finishing mill might be assistant rougher, rougher pulpit operator, rougher, speed operator and finish roller. Workers can be trained for skilled jobs, such as blower, melter, and roller, which are among the highest rated steelmaking jobs, in a minimum of 4 or 5 years, but they may have to wait 25 or 30 years before openings occur.

To help them advance in their work, many employees take part-time courses in subjects such as chemistry, physics, and metallurgy. Steel companies sometimes provide this training—often within the plant. Other workers take evening courses in high schools, trade schools, or universities or enroll in correspondence courses.

Although many maintenance workers start as helpers and pick up their skills from experienced workers, apprenticeship is the best way to learn a maintenance trade. Apprenticeship programs usually last 3 or 4 years and consist mainly of shop training in various aspects of the particular jobs. In addition, classroom instruction in related technical subjects usually is given, either in the plant or in local vocational schools.

Steelmaking companies have different qualifications for apprentice applicants. Generally, employers require applicants to have the equivalent of a high school or vocational school education. In most cases, the minimum age for applicants is 18 years. Some companies give aptitude and other types of tests to applicants to determine their suitability for the trades. Apprentices generally are chosen from among qualified workers already employed in the plant.

The minimum requirement for engineering and scientific jobs usually is a bachelor's degree with an appropriate major. Practically all the larger companies have formal training programs for college-trained technical workers. In these programs, trainees work for brief periods in various operating and maintenance divisions to get a broad picture of steelmaking operations before they are assigned to a particular department. In other companies, the newly hired scientist or engineer is assigned directly to a specific research, operating, maintenance, administrative, or sales unit. Engineering graduates frequently are hired for saleswork and many of the executives in the industry have engineering backgrounds. Engineering graduates, as well as graduates of business administration and liberal arts colleges, are employed in sales, accounting, and labor-management relations, as well as in managerial positions.

Completion of a business course in high school, junior college, or business school is preferred for entry into most of the office occupations. Office jobs requiring special knowledge of the steel industry generally are filled by promoting personnel already employed in the industry.

Employment Outlook

Employment in the iron and steel industry is not expected to change significantly in the long run (1974-85). Nevertheless, many workers

will be hired to replace those who retire, die, or transfer to other fields. The total number hired may fluctuate from year to year because the industry is sensitive to changes in business conditions and defense needs.

Production of iron and steel is expected to increase moderately as population and business growth create a demand for more automobiles, household appliances, industrial machinery, and other products that require large amounts of these metals. Because of laborsaving technology, however, employment is not expected to keep pace with increases in production. Giant blast furnaces are being built that make more iron per worker than the smaller furnaces they are replacing. Open hearth furnaces will continue to be replaced with more efficient basic oxygen furnaces, increasing the amount of steel produced per worker. Older primary rolling mills will be replaced by continuous casters, which use fewer employees to produce slabs, billets, and blooms. Greater use of computers to control plant equipment, as in hot finishing mills, and to process business records also will increase efficiency.

Employment trends will differ among occupations. The number of engineers, metallurgists, laboratory technicians, and other technical workers will increase as the industry's research and development programs expand. Employment of computer programmers and operators also will increase. More maintenance workers will be needed to maintain the increasingly complex machinery used by steel mills. Employment in processing occupations, on the other hand, is expected to decline slightly as more efficient plant machinery and equipment are introduced.

Earnings and Working Conditions

Earnings of production workers in iron and steelmaking are among the highest in manufacturing. In 1974, they averaged $6.25 an hour, while production workers in manufacturing as a whole averaged $4.40. To show how earnings vary by occupation and department, wage rates for employees in some of the principal occupations are presented in table 1. However, most steelworkers are paid on an incentive basis—that is, the more they produce the more they earn—and often earn more than the table would indicate.

Basic straight-time hourly earnings[1] of workers in selected occupations in basic iron and steel establishments, mid-1974

	Hourly earnings
Blast furnaces:	
Larry operators	$5.10
Keepers	5.50
Basic oxygen furnaces:	
Second assistants	5.20
Furnace operators	6.40
Open hearth furnaces:	
Charging machine operators	5.70
Furnace operators	6.50
Bloom, slab, and billet mills:	
Soaking pit crane operators	5.60
Rollers	6.80
Continuous hot-strip mills:	
Roughers	5.70
Rollers	7.30
Maintenance:	
Bricklayers	5.80
Millwrights	5.70

[1]Excludes premium pay for overtime and for work on weekends, holidays, and late shifts.

Most plantworkers in the iron and steel industry are members of the United Steelworkers of America. Agreements between steel companies and the union include some of the most liberal benefits in industry. Most workers receive vacation pay ranging from 1 to 4 weeks, depending on length of service. A worker in the top 50 percent of a seniority list receives a 13-week vacation every 5 years; the remaining workers receive 3 extra weeks of vacation once in a 5-year period. Professional and executive personnel in some companies receive similar benefits.

Workers may retire on company-paid pensions after 30 years of service, regardless of age. Employees having 2 years of more of service are eligible to receive supplemental unemployment benefits for up to 52 weeks. Other benefits include health and life insurance, and education and scholarship assistance.

Working conditions vary by department. Maintenance shops generally are clean and cool. Rolling mills and furnaces are hot and noisy. Many plants, however, have developed methods to reduce job discomfort. The use of remote control, for example, enables some employees, such as furnace operators, to work outside the immediate vicinity of processing operations. In other instances, the cabs in which the workers sit while operating mechanical equipment, such as cranes, may be air-conditioned. Because certain processes are continuous, many employees are on night shifts or work on weekends.

Sources of Additional Information

For additional information about careers in the iron and steel industry, contact:

American Iron and Steel Institute, 1000 16th St. NW., Washington, D.C. 20036.

United Steelworkers of America, 1500 Commonwealth Building, Pittsburgh, Pa. 15222.

OCCUPATIONS IN LOGGING AND LUMBER MILLS

Young people who have a high school education and a love for the outdoors and wildlife may find rewarding careers in the logging and lumber industry. Logging camps and sawmills provide many job opportunities in the South and Pacific Northwest, the Nation's major timber-producing regions. Because the building and furnishing of homes, hospitals, schools, stores, and most other structures depend upon lumber and wood products, thousands of job openings will be available each year through the mid-1980's.

Nature and Location of the Industry

In 1974, nearly 85,000 wage and salary workers were employed in logging to help harvest trees and remove them from forests. A much larger number—about 220,000—worked in sawmills and planing mills where logs are converted into lumber. In addition, about 50,000 workers were self-employed, most of them in logging.

This statement deals with activities and jobs involved in cutting and removing timber from forests and in the processing of logs into rough and finished lumber. It excludes the manufacture of paper, plywood, veneer, and other wood products such as furniture and boxes. Occupations in paper manufacturing are discussed in a separate statement elsewhere in the *Handbook*.

Lumber production has followed the same basic process for many years. A stand of timber is harvested in the forest, moved to a central location or "landing" accessible to transportation, and then carried by truck or rail to a mill for processing. Logging crews typically consist of from 5 to 15 workers. Several crews, each working at a different location, may be needed to supply logs for a single mill. The crew moves through the forest as one area after another is harvested. Years ago these workers lived in camps close to the cutting site. With better roads, almost all can now live at home and commute to work.

In the sawmill, logs are debarked, rough-sawn into various widths and lengths, and then seasoned (dried) so the wood will not warp. A small amount of rough lumber is sold without further processing, but the rest must be sent to a planing mill before it goes to market. In this mill, rough boards are finished to give them a smooth surface. Boards also are made into flooring, siding, moulding, and other forms of building trim. Since logs cost more to ship than lumber, sawmills usually are located near tree harvesting areas. Some of these mills are small, portable operations that can be moved about from week to week as the harvest progresses, but the large ones are permanent. Planing mills may be near sawmills or hundreds of miles away. About three-fourths of all mills employ fewer than 20 workers, but some have more than 100.

Although some logging and lumber mill workers are employed in nearly every State, seven States account for about half of the industry's employment: Oregon, Washington, California, Alabama, North Carolina, Arkansas, and Georgia.

Nature of the Work

Logging. Before a stand of timber is harvested, a *forester* (D.O.T. 040.081) decides which trees to cut. Foresters also map the cutting areas, plan and supervise the cutting, and plant seedlings to replace the trees that were removed. *Timber cruisers* (D.O.T. 449.287) estimate the amount and grade of standing timber and help foresters make maps. Heavy equipment operators build access roads and trails to the cutting and loading areas so that they can be reached by logging crews.

The initial harvesting task—"falling and bucking"—is the process of cutting the tree down and further cutting (bucking) it into logs for easier handling. *Fallers* (D.O.T. 940.884), working singly or in pairs, use powersaws to cut down trees marked by the forester. Expert fallers can usually drop a tree in the exact spot where they want it, making sure other trees are not injured in the process. As soon as the tree is down, *buckers* (D.O.T. 940.884) saw the limbs off and saw the trunk into logs.

The next task—"skidding"—is a method of removing logs from the cutting area. A choker (steel cable) is noosed around the log by *choker setters* (D.O.T. 942.887) and then attached to a tractor which drags or "skids" the log to the landing. A *rigging slinger* (D.O.T. 942.884) supervises and assists choker setters and tractor drivers. In rough terrain in the West, where logs must be moved up or down steep slopes or across ravines, the "highlead" method is used instead of tractor skidding. This method is somewhat like a fishing rod and reel. Steel cables run from a diesel-powered winch (reel) through pulleys at the top of a large steel tower (rod) and down to the cutting area which may be hundreds of feet away from the tower. Choker setters noose the end of the cable around a log and a *yarder engineer* (D.O.T. 942.782) operates the winch to pull the log into the landing. Experiments are

Logging worker uses chain saw to divide tree trunk into logs.

now being made with heavy duty helicopters. Hovering above a logging site, the helicopters can lift and move logs weighing several tons. Balloons also are being tried.

After logs reach the landing, they are loaded on a truck trailer and hauled to a mill. A *loader engineer* (D.O.T. 921.883) operates a machine that picks up logs and places them on the trailer. A *second loader* (D.O.T. 949.884) directs the positioning of logs on the trailer. Although trucks usually are used, logs are sometimes carried by railroad cars.

Sawmills and Planing Mills. At the sawmill incoming logs are stacked on the ground (cold decking) or dumped into a pond to await cutting. Water storage protects the logs from splitting, insect damage, and fire. Cold decking, on the other hand, permits greater storage volume per acre, and some hardwoods such as oak must be stored this way because they will sink in water. *Scalers* (D.O.T. 941.488) measure logs and look for defects, such as knots and splits, to estimate the amount and quality of lumber available. *Pond workers* (D.O.T. 921.886) wearing spiked boots walk about on the logs in the pond and use long poles to sort them so that all of one kind or size go into the mill together.

A *bull-chain operator* (D.O.T. 921.885) controls a conveyor that pulls logs up a chute into the sawmill. A *barker operator* (D.O.T. 533.782) operates machinery to remove bark and foreign matter that could damage saws. One kind of machine has rough metal bars or knives that rub or chip the bark away. Another kind tears it off with the high pressure force of water. The removed bark may be processed into garden mulch or burned to produce heat and steam for the sawmill.

As a log enters the sawing area, a *deck worker* (D.O.T. 667.887) rolls it onto a platform called a "carriage," and a *block setter* (D.O.T. 667.885) aligns the log and locks it into position. The carriage, which moves back and forth on rails, carries the log into the teeth of a large bandsaw, and each time it passes the saw a board is sliced off. This operation is controlled by a *head sawyer* (D.O.T. 667.782), who is one of the most experienced workers in the mill. The quantity of lumber obtained from logs depends largely on the head sawyer's skill and knowledge.

After leaving the carriage, the lumber moves to an edger saw, consisting of two or more circular blades. Operated by a *pony edger* (D.O.T. 667.782), the edging machinery cuts the lumber to the desired width. For example, the production run may be cutting boards to a 4-inch width. Next, a *trimmer saw operator* (D.O.T. 667.782), using a series of circular cross-cut saws, cuts the lumber to various lengths, such as 8, 10, or 12 feet.

When all sawing is completed, a conveyor system moves the rough lumber into a sorting shed, where *graders* (D.O.T. 669.587) examine each board and determine its grade. After grading, *sorters* (D.O.T. 922.887) pull and stack the lumber according to type, grade, and dimension.

At this stage, the lumber is still green and must be seasoned so that it will not shrink or warp. It may be stacked outdoors where the sun and wind will remove moisture. More frequently, however, it is placed in a specially heated building (dry-kiln). *Dry-kiln operators* (D.O.T. 563.381) control temperature, humidity, and ventilation in kilns.

Some seasoned lumber is ready for use without further processing, primarily in the construction industry. Most of the lumber must pass through a mill before being shipped to market. In this mill, the rough dried lumber is run through a set of rotating knives controlled by a *planer operator* (D.O.T. 665.782). Some knife heads produce smooth surfaces, while others tongue-and-groove the boards for flooring or paneling. Similarly, a wide variety of moulding or other building trim may be cut. The dressed or finished lumber is usually graded again before storage or shipment by a *planer mill grader* (D.O.T. 669.587).

In addition to occupations described in the logging and milling processes, many other occupations require a broad range of training and skills. Maintenance mechanics install and repair saws and related machinery. Saw filers sharpen and repair saws, and electricians maintain and repair wiring, motors, and other electrical equipment. Truckdrivers transport logs to the mills and deliver the finished lumber products to wholesalers.

Many workers are employed in clerical, sales, and administrative occupations. For example, many firms employ office managers, purchasing agents, personnel managers, salesworkers, office clerks, stenographers and typists, bookkeepers, and business machine operators. Also, the industry employs professional and technical workers, such as civil and industrial engineers, drafters and surveyors, and accountants. (Detailed discussions of professional, technical, and mechanical occupations, found not

Mechanized equipment in modern sawmills reduces need for hand labor.

only in logging and milling but in other industries as well, are given elsewhere in the *Handbook* in sections covering individual occupations.)

Training, Other Qualifications, and Advancement

Most loggers and millhands get their first jobs without previous training. Employers prefer high school graduates, but applicants with less education frequently are hired. Entry level jobs usually can be learned in a few weeks by observing and helping experienced workers. A beginner on a logging crew may start by helping choker setters or buckers. In the mill, a beginner may be assigned to a labor pool to do odd jobs, such as stacking and sorting lumber. As workers gain experience, and as vacancies occur, they can advance to higher paying jobs. A choker setter who has an aptitude for operating machinery, for example, may become a truck or tractor driver, or a yarder engineer. Millhands also can learn various kinds of machine operating jobs, such as bull-chain operator and pony edger.

Mechanics, electricians, and others who repair and maintain the industry's equipment are trained on the job under the guidance of supervisors and experienced workers. In some firms, this training is supplemented by classroom instruction. Maintenance trainees frequently are selected from workers already employed in mills or logging crews. Many firms, however, will hire inexperienced people who have mechanical aptitude. Generally, it takes a trainee 3 to 4 years to become skilled in one of the maintenance jobs.

Workers who have leadership ability and years of experience can advance to supervisory positions in mills and logging crews. As in other industries, however, opportunities for promotion are limited because relatively few of these positions exist.

Loggers and millhands must be in good physical condition. Although modern equipment has reduced some of the heavy labor, stamina and agility are still important qualifications, particularly for loggers. Because of the danger involved in operating and working around heavy machinery, workers should be alert and well coordinated.

A bachelor's degree usually is the minimum educational requirement for forester, engineer, accountant, and other professional occupations. Completion of commercial courses in high school or business school usually is adequate for entry into clerical occupations, such as secretary, typist, and bookkeeper.

Employment Outlook

Employment in logging and lumber mills is expected to decline through the mid-1980's despite increases in wood production to meet the Nation's population and industrial growth. Laborsaving machinery will make it possible to harvest and process more lumber with fewer employees. Nevertheless, several thousand new workers will be needed each year to replace those who retire, die, or leave the industry for other reasons. The number of job openings may fluctuate from year to year, however, because the demand for lumber is sensitive to changes in construction activity.

Employment in logging camps and mills will decline over the long run as more modern equipment and techniques are adopted. A tree shear, for example, which has a scissor-like pair of blades, can cut down a tree four times as fast as a saw. As more of these shears come into use, fewer logging workers will be required. Sawmills and planing mills may reduce employment requirements by installing new machinery and improving plant layouts. In the kiln area, for example, a stacking machine operated by

Logging	Hourly rates	
	South	West Coast
Deck workers	$2.30	$4.40
Pond workers	2.55	4.40
Sorters	2.25	4.40
Trimmers	2.35	4.60
Checker setters	2.45	4.75
Block setters	2.50	4.85
Pony edgers	2.45	4.95
Lumber stackers	2.25	4.95
Truckdrivers	2.50	5.00
Planer operators	3.30	5.20
Graders, planed lumber	2.70	5.35
Tractor drivers, skidding	2.70	5.55
Head-saw operators, circular saw	3.40	6.00
Head-saw operators, band saw	4.45	6.40
Fallers and buckers, power	2.85	7.95

two or three people can replace six who stack by hand.

Although employment in the industry as a whole is declining, certain occupations will grow. Additional mechanics, for example, will be needed to maintain the growing stock of logging equipment, trucks, and mill machinery. More foresters will find jobs in this industry as forest replanting and conservation programs receive greater attention. Mechanical and electrical engineers will be in greater demand as the industry's production methods become more complex. As in the past, however, most of the industry's job openings will be for logging and millworkers; because they make up a very large proportion of the industry's total employment, replacement needs are high.

Summer jobs sometimes are available for high school students 17 years of age or older. These jobs are unskilled and include such tasks as working on a survey crew, helping haul logs to landings, clearing brush, and fighting forest fires.

Earnings and Working Conditions

In 1974, production workers in sawmills and planning mills averaged $3.79. In comparison, production workers in manufacturing industries as a whole averaged $4.40 an hour.

Wage rates in logging vary considerably by occupation, size of firm, machines and equipment used and, above all, by geographic area. Estimated average hourly rates for selected occupations in West Coast and Southern logging operations and mills in 1974 are shown in the accompanying tabulation.

Most logging jobs are outdoors. The forest may be wet, muddy, and hot, with annoying insects during the summer; conversely, working conditions may be difficult and time lost because of snow, sleet, and low temperature during the winter. Sawmills and planing mills may be noisy and dusty, and uncomfortably warm during the summer. Moreover, work at logging sites and in mills is more hazardous than in most manufacturing plants. For many persons, however, the opportunity to work and live in forest regions away from crowded cities more than offsets these disadvantages.

The major unions in this industry are the International Woodworkers of America and the United Brotherhood of Carpenters and Joiners of America, both AFL—CIO affiliates. A large proportion of the industry's production workers on the West Coast are covered by union-management contracts. On the other hand, relatively few of those in the South were covered.

Sources of Additional Information

For further information about job opportunities and working conditions, contact:

International Woodworkers of America, 1622 N. Lombard St., Portland, Oreg. 97217.

Wood Industry Careers, National Forest Products Association, 1619 Mass. Ave. NW., Washington, D.C. 20036.

MOTOR VEHICLE AND EQUIPMENT MANUFACTURING OCCUPATIONS

The automobile industry employs more workers than any other single manufacturing industry. Moreover, it is a major consumer of steel, rubber, plate glass, and other basic materials. Many businesses, including repair shops, gas stations, highway construction, and truck and bus transportation facilities, have been created because of motor vehicles.

To build the more than 10 million vehicles produced in 1974, the automobile industry employed 860,000 workers. In addition to workers discussed in this chapter, thousands of persons work in other industries that produce automobile glass, automotive stampings, lighting systems, storage batteries, tires, and many other components.

Like other large industries, the automobile industry employs people with widely different levels and types of education and training. Job requirements vary from a college degree for engineers and other professional and technical workers to a few hours of on-the-job training for some assemblers, materials handlers, and custodians.

Nature and Location of the Industry

The automobile industry is able to produce millions of vehicles because of mass production of standardized parts and assembly line manufacturing. Parts plants make thousands of interchangeable parts. At the assembly plants workers put these parts together to build a complete vehicle. New cars are driven off the assembly line at the rate of about one a minute.

The industry has about 3,000 plants, ranging from small parts plants with only a few workers to huge assembly plants that employ several thousand. About 85 percent of the industry's employees work in plants with 500 workers or more.

Over two-thirds of the automobile industry's employees work in the Great Lakes region, including Michigan, Ohio, Indiana, Illinois, Wisconsin, and western New York. Michigan alone has almost 40 percent of the total, with half of these workers in the Detroit metropolitan area. Other important automobile industry centers in the Great Lakes area are Flint and Lansing, Michigan; Cleveland and Warren, Ohio; Indianapolis and Ft. Wayne, Indiana; Buffalo, New York; and Chicago, Illinois.

Major automobile manufacturing centers are also found in other parts of the country, including Los Angeles, San Francisco, Kansas City, St. Louis, Atlanta, and Philadelphia.

How Automobiles are Made

There are three stages in making an automobile: designing, engineering, and testing; production of parts and subassemblies; and final assembly. (Although the rest of this statement discusses only automobiles, the information also applies to trucks, buses, and other motor vehicles.)

Designing, Engineering, and Testing. About 2 to 3 years of designing, engineering, and testing precede the actual production of a new car.

First, executives decide what kind of car to produce—a sports car, compact, or luxury car—and approve basic specifications for the car's size and cost. Stylists design the car's body and interior. From the stylists' sketches and drawings, skilled model makers make scale and full-size clay and fiberglass models of the car. The models are used to refine the styling, to evaluate safety features, and finally to make master dies for producing the car. Engineers design the car's engine, transmission, suspension, and other parts. Their designs must meet safety and pollution control standards, as well as pass cost, fuel economy, and performance tests. They work with physicists, chemists, metallurgists, and other scientists on research to develop new parts, stronger and lighter metal alloys, new ways to use plastic and fiberglass, and thousands of other improvements. Engineers also work with drafters who draw up blueprints and specifications.

Each new design and improvement is thoroughly tested in the laboratory and on the road. Engines are run thousands of miles under nearly all driving conditions. Safety features are tested in the laboratory and in actual crashes. Components that fail must be redesigned before the car can be produced.

Production of Parts. Once the car is finally designed and tested, the thousands of parts that are needed to assemble complete vehicles must be produced. Parts are made from a variety of materials, including steel, copper, aluminum, glass, rubber, plastic, and fabric.

Several different methods are used to make metal parts. The casting process is used for bulky parts such as engine blocks. Axles and other parts that must withstand great stress are forged. Body panels are stamped out of sheet metal by huge presses. Some parts are machined to exact dimensions. Some parts are made entirely by machine. These metalworking

processes are explained more fully under plant occupations.

Other parts are produced by a variety of manufacturing processes. Plastic and glass parts are molded and cut, seat cushions are sewn, and many parts are painted. Parts are also assembled into units or "subassemblies," such as complete transmissions.

Throughout production many inspections and tests are made to ensure that the assembled car will meet quality and safety standards.

Final Assembly. After many months of designing, testing, and producing parts, the car is finally assembled. Workers attach the parts and subassemblies in the right order as a conveyor carries the chassis along the assembly line. Axles are attached; the engine and transmission are mounted; body panels are welded together, painted, and joined to the chassis; instrument panels and seats are installed. Near the end of the line, hubcaps, mirrors, and other finishing touches are added. Gasoline is pumped into the fuel tank, headlights and wheels are aligned, and the car is inspected and driven off the line. The whole final assembly process may take as little as 90 minutes.

Assembling hundreds of cars a day requires expert timing and coordination. Parts and subassemblies are delivered according to production schedules arranged months in advance. They are fed continually to workers from storage areas along the assembly line. Instructions for the color and special equipment for each car are transmitted along the line. This system allows cars of different colors and types to follow each other on the assembly line—a blue sedan may follow a red station wagon. Inspections are made at many assembly stations to make sure the car is put together correctly.

Occupations in the Industry

The automobile industry employs workers in hundreds of occupations. Semiskilled plant workers, including assemblers and inspectors, make up about one-half of all employees. An additional one-quarter are supervisors, machinists, tool and die makers, mechanics, and other skilled craftworkers. Clerical workers make up another one-tenth of the total. The rest are professionals, technicians, salesworkers, managers, guards, and unskilled workers.

Some of the important occupations are described briefly below. Detailed discussions of many of the professional, technical, craft, and plant jobs may be found elsewhere in the *Handbook*.

Professional and Technical Occupations. The modern automobile is the product of the research, design, and development work of thousands of engineers, chemists, drafters, and other professional and technical workers.

Over 30,000 engineers worked in the automobile industry in 1974. Most of them were mechanical, electrical, or industrial engineers. Mechanical engineers design improvements for engines, transmissions, and other working parts. Electrical engineers design the car's electrical system, especially the ignition system and accessories. Industrial engineers concentrate on plant layout, work standards, scheduling, and other production problems. The industry also employs metallurgical, civil, chemical, and ceramic engineers.

The industry employed over 3,000 mathematicians, physicists, chemists, and other physical scientists in 1974. Most of them work on research and development projects such as finding ways to reduce fuel consumption and air pollution and studying the behavior of metals under certain conditions. Mathematicians and statisticians design quality control systems and work with research scientists and engineers. Some scientists supervise technical phases of production. Metallurgists, for example, supervise melting and heating operations in the casting and forging departments.

Drafters are the largest group of technical workers. They work closely with engineers and stylists to draft blueprints and specifications for each part of the car. Engineering aides, laboratory assistants, and thousands of other technicians also assist engineers and scientists.

Administrative, Clerical, and Related Occupations. Executives decide what kind of vehicles to produce, what prices to charge, where to build plants, and whether to manufacture or buy certain parts. They are assisted by lawyers, market analysts, economists, statisticians, industrial relations experts and other professionals, who may also supervise plant or office staffs. Purchasing agents, personnel managers, and other administrative workers direct special phases of the company's business.

Secretaries, bookkeepers, shipping clerks, keypunch and business machine operators, typists, and other clerical employees work in the industry's plants and offices.

Plant Occupations. About three-fourths of the automobile industry's employees work in the plant. Most of them make parts or work on the assembly line. Others service and repair machinery and equipment.

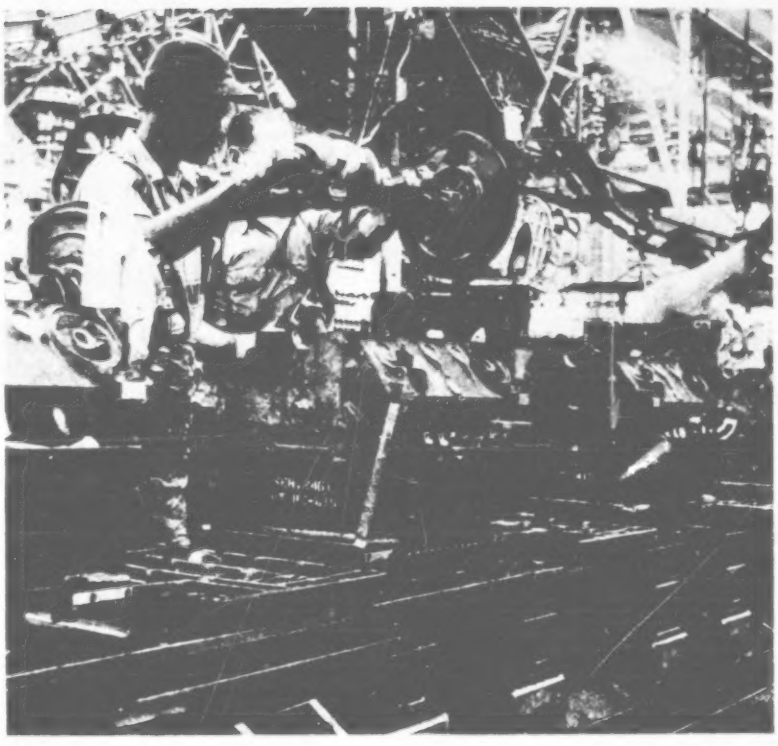
Foundry Occupations. Engine blocks and many other parts are "cast" or molded from melted metal. Patternmakers, coremakers, and machine molders make sand molds which have a hollow space inside in the shape of the part. Workers called melters and pourers melt the metal in electric furnaces, or cupolas, and pour it into the mold. After it cools and hardens into the shape of the part, shakeout workers remove the casting from the mold.

Forging Occupations. Axles, driveshafts, and other forged parts are made by pounding metal into dies. Workers called heaters heat the metal in a furnace and place it in a forging die. Hammerers then use a drophammer to pound the metal into the shape of the die. Other forge shop workers clean, finish, heattreat, and inspect forged parts.

Machining and other Metalworking Occupations. Most rough cast, forged, and some stamped parts must be machined to exact dimensions before they can be used. Machine tool operators, representing one of the industry's largest metal working occupations, run machine tools that cut or grind away excess metal from rough parts. Most operators use only one kind of machine tool and are called lathe operators, milling machine operators, or some other special title. Operators on some machines make simple tool changes and gauge machined areas of the parts.

Some machine tools are automatic and can be linked together to do a series of machining operations. A rough engine block, for example, can be moved through hundreds of automatic drilling, cutting, and grinding operations with little or no manual labor. Some of the inspection is also automatic. Workers must monitor a control panel to spot interruptions and breakdowns.

Assembly Occupations. The largest group of workers in the automobile industry are the *assemblers* (D.O.T. 806.887). They put together small parts to make subassemblies, and put subassemblies together to build a complete vehicle. Each assembler has a specific job to do as the vehicle passes a work station. For example, one worker mounts a tire and the next worker tightens the nuts with a power wrench. Most assembly jobs are repetitive and require limited skills. However, they do require good coordination, and may be strenuous.



Assemblers install crank shaft into cylinder block.

Finishing Occupations. "Finishing" includes painting, polishing, upholstering, and other operations that protect the car's surface and add to the car's comfort and appearance. *Electroplaters* (D.O.T. 500.885) coat bumpers, grills, hubcaps, and trim with chrome. *Metal finishers* (D.O.T. 705.884) file and polish rough metal surfaces in preparation for painting. *Sprayers* (D.O.T. 741.887) apply primers and paint with power spray guns. *Polishers* (D.O.T. 705.884) polish finished surfaces by hand or with a power buffing wheel.

Several different kinds of workers combine their skills to make the car's upholstery. Working from a pattern, *cutters* (D.O.T. 781.884) cut fabric or leather with hand or electric shears. *Sewing machine operators* (D.O.T. 787.782) sew the pieces together into seat covers or headliners. *Cushion builders* (D.O.T. 780.884) fasten springs, padding, and foam rubber to the seats and other upholstered areas and install the covers.

Inspection Occupations. (D.O.T. 806.281, .283, .381, .382, .387, .684, and .687). Throughout the manufacture and assembly of a new car, inspectors inspect certain parts for defects. They inspect raw materials, examine parts during manufacturing, check the quality and uniformity of subassemblies, and test-drive the new car. Inspectors need various skills, depending on the part of process they inspect. Many of them use micrometers, gauges, and testing instruments and read blueprints and specifications.

Other Plant Occupations. Many

other workers help keep the plant operating by delivering materials and parts, repairing equipment, and cleaning and guarding the plant.

Assembly line production requires an elaborate materials handling and delivery system. Materials handlers load and unload raw materials and parts from trucks, ships, and railroad cars. Overhead crane operators move heavy machinery and raw steel. Power truck operators move parts and materials about the plant. Checkers, stock chasers, and stock clerks make sure parts and tools are delivered to the assembly line at the right time. They receive and distribute materials and keep records of shipments.

A large staff of workers set up the plant's equipment and keep it in good condition. Skilled maintenance mechanics and electricians service and repair complex mechanical hydraulic, electrical, and electronic equipment. Millwrights move and install heavy machinery. Plumbers and pipefitters lay out, install, and repair piping, valves, pumps, and compressors. Carpenters, stationary engineers, and sheet-metal workers also work in automobile plants.

The industry also employs many protective and custodial workers, including guards, janitors, and porters.

Training, Other Qualifications, and Advancement

Engineers and scientists must have at least a bachelor's degree with an appropriate major. Advanced degrees or specialized experience are sometimes required for research and development jobs. About a dozen colleges offer undergraduate or graduate courses in automotive engineering, and many companies have training programs in automotive specialties for engineers and scientists. Most companies also offer grants, loans, or tuition refund plans to their employees for advanced study. Engineers and scientists may become supervisors of research or production units, and sometimes enter administrative or executive positions.

Most automotive stylists are graduates of art institutes or have bachelor's degrees in industrial design. They should have a background in practical applications, such as model building, as well as in design theory and techniques.

Most engineering aides, laboratory assistants, drafters, and other technicians in the automobile industry are graduates of technical institutes or junior colleges. Others are trained on the job, at company schools, or at company expense at local technical schools or junior colleges. Technicians sometimes advance to engineering jobs through experience and study toward an engineering degree.

Although a college education is not always required, administrative jobs are usually filled by people with degrees in business administration, engineering, marketing, accounting, industrial relations, and similar fields. Some companies offer advanced training in these specialties.

For semiskilled jobs, the industry seeks people who can do routine work at a steady pace. Most assembly jobs can be learned in a few hours, and the less skilled machine operating jobs can be learned in a few weeks. Plant workers should be in good health and have good coordination and ability to do mechanical work.

Tool and die makers, patternmakers, electricians, and some other craftworkers in the automobile industry need at least 4 years of training. Although many persons learn their skills by working with experienced craftworkers, apprenticeship training is the best way to learn a skilled trade. Automobile manufacturers, working with labor unions, offer apprenticeships in many crafts.

Applicants for apprenticeship usually must be high school, trade, or vocational school graduates, or have equivalent training. Training should include mathematics, science, mechanical drawing, and shop courses. Apprentices must pass physical examinations, mechanical aptitude tests, and other qualifying tests.

Apprenticeship includes both classroom and on-the-job instruction. Shop math, blueprint reading, shop theory, and such special subjects as electronics and hydraulics are studied in the classroom. In the shop, apprentices learn the techniques of their trade and how to use tools and machinery.

Supervisors usually are selected from workers already employed in the firm, especially if they have completed an apprenticeship and have considerable experience. Newly promoted supervisors usually go through a special training program.

Employment Outlook

Employment in the automobile industry is not expected to increase significantly through 1985. Nevertheless, thousands of workers will be hired in this large industry each year to replace those who retire, die, or transfer to other industries. The total number hired will fluctuate from year to year because the industry is sensitive to changes in general business conditions, consumer preferences, availability of credit, and defense activity.

The production of motor vehicles is expected to increase during the next decade as population and income increase. Because of labor-saving technology, however, employment in the industry will not keep pace with production. Automobile companies will use more automated and computerized equipment for machining, assembling, and inspecting. A recent example is the versatile "industrial

robot" which can be programmed to weld body panels, feed parts into machine tools, and do a variety of other tasks. Also, new or modernized plants will have the latest conveyor equipment for moving parts and materials.

Some of the industry's increased efficiency, however, will be offset by other developments. More workers will be needed to design, test, and build cars with improved safety, exhaust control, and fuel consumption features.

Changes in the kinds of vehicles built and how they are produced will affect the type as well as the number of workers employed in the automobile industry. More engineers, scientists, technicians, and other professionals will be employed to meet the industry's research and development needs, especially to design new engines, exhaust systems, and safety equipment. The use of computers will increase the need for systems analysts and programmers, but will limit employment growth in many clerical occupations.

The employment of skilled workers, as a group, may decline, mainly because fewer machinists and tool and diemakers will be needed as more efficient processes are introduced. Some skilled occupations will grow, including electricians, millwrights, pipefitters, and machine repairers. Overall, the number of semiskilled workers will decline slightly.

Earnings and Working Conditions

Production workers in the automobile industry are among the highest paid in manufacturing. In 1974 they averaged $5.90 an hour, compared to $4.40 an hour for production workers in all manufacturing industries.

Besides wages and salaries, automobile workers receive a wide range of fringe benefits. They are paid one and one-half times their normal wage for working more than 8 hours a day or 40 hours a week, or for working on Saturday. They receive premiums for working late shifts, and double the normal wage for Sundays and holidays. Most workers get paid vacations (or payment instead of vacations) and 12 paid holidays a year. Most companies provide annual wage increases, plus automatic increases when the cost of living rises. Life, accident, and health insurance are provided, also.

A great majority of the industry's workers are covered by company-paid retirement plans. Retirement pay varies with length of service. Many plans provide for retirement at age 55, or after 30 years of service regardless of age.

Most wage workers and some salaried employees receive supplemental unemployment benefit plans, paid for entirely by their employers. These plans provide pay during layoffs and also provide short-workweek benefits when workers are required to work less than a full week. During layoff, provisions are included for life, accident, and health insurance; survivor income benefits; relocation allowances; and separation payments for those laid off 12 continuous months or more.

Most production maintenance workers in assembly plants, and a majority in parts plants, belong to the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America. In some parts plants, the International Union, Allied Industrial Workers of America is the bargaining agent. Other workers belong to the International Association of Machinists and Aerospace Workers; the Pattern Maker's League of North America; the International Molders' and Allied Workers' Union of North America; the Metal Polishers Buffers, Platers, and Helpers International Union; the International Union, United Plant Guard Workers of America (Ind.); the International Brotherhood of Electrical Workers; the International Union of Electrical, Radio, and Machine Workers; and the International Die Sinkers' Conference (Ind.).

Most automobile industry employees work in plants that are relatively clean and free of dust, smoke, and fumes. Some work areas, however, are hot, noisy, and filled with dust and fumes. These conditions have been greatly improved by the introduction of better ventilation and noise control systems.

Sources of Additional Information

Information on employment and training opportunities in the automobile industry can be obtained from local offices of the State employment service; employment offices of automobile firms; locals of the unions listed above; and from:

International Union, United Automobile, Aerospace and Agricultural Implement Workers of America, 8000 East Jefferson Ave., Detroit, Mich. 48214.

Motor Vehicle Manufacturers Association of the U.S., Inc., 320 New Center Building, Detroit, Mich. 48202.

Information on careers in automotive engineering and a list of schools offering automotive engineering courses are available from:

Society of Automotive Engineers, 2 Pennsylvania Plaza, New York, N.Y. 10001.

OFFICE MACHINE AND COMPUTER MANUFACTURING OCCUPATIONS

During the last decade, employment in the office machine and computer industry grew much faster than employment in manufacturing as a whole. Growth was spearheaded by a rapid expansion in the production of computers. For many years, the industry's chief products were typewriters, adding machines, calculators, and other conventional office machines. Today, plants that make computers account for more than half of the industry's production.

Nature and Location of the Industry

In 1974, the office machine and computer manufacturing industry employed 294,000 workers in approximately 1,000 plants. About 7 out of every 10 of them worked in plants that produced computer equipment, the remainder in plants that produced conventional office machines and scales and other weighing devices.

Computer equipment manufacturing plants employed about 210,000 workers in 1974. These plants manufacture general purpose computers as well as those used for special applications, such as space exploration and missiles. They also manufacture related equipment such as machines that read magnetic numbers on bank checks. In addition to computers and related equipment, plants may furnish "software" (computer programs and operating systems). Thousands of people whose employment is not included in this chapter are employed outside manufacturing plants by firms that specialize in software or that rent or lease computers and provide related services.

In 1974, more than 80,000 people were employed in factories that produced conventional office machines and scales. Of this total, nearly half produced desk calculators, cash registers, coin and ticket counters, and adding, accounting, and voting machines; the rest produced typewriters, industrial and household scales and miscellaneous office machines, including items as diverse as postage meters and dictating machines.

Large plants account for most of the employment in office machine and computer manufacturing. A majority of the industry's employees are in plants that have 1,000 or more employees; several computer plants have more than 5,000 employees.

California, New York, and Minnesota have about two-thirds of computer manufacturing employment, and the following States employ most of the remainder: Massachusetts, Pennsylvania, Arizona, Florida, Texas, North Carolina and Colorado. In New York, the lower Hudson River Valley area has many important computer manufacturing centers: Poughkeepsie, East Fish Kill, and Kingston. Large manufacturing plants also are located in Rochester and Utica, N.Y., and in the Boston, Mass., and Philadelphia, Pa. areas. The leading center in the Midwest is Minneapolis-St. Paul. The Los Angeles and San Diego industrial areas are the most important computer manufacturing centers in the West, followed by Phoenix, Ariz.; and San Jose, Calif.

Most of the conventional business machine manufacturing employment is located in nine States: Ohio, Kentucky, New York, Michigan, California, Illinois, Delaware, New Jersey, and Connecticut. Some of the important manufacturing centers are: Dayton, Toledo, and Euclid, Ohio; the New York-Northeastern New Jersey industrial area; Hartford and Stamford, Conn.; Chicago, Ill.; Detroit, Mich.; and Lexington, Ky.

Occupations in the Industry

A variety of occupations, requiring a broad range of training and skills, are found in plants that make office machines and computers. More than half of the industry's workers are in white-collar jobs (engineering, scientific, technical, administrative, sales, and clerical); the others are in plant jobs (assembly, inspection, maintenance, transportation and service).

White-collar workers represent a significantly larger proportion of total employment in the computer industry than in most other manufacturing industries because of the highly complex nature of computer manufacturing.

Some of the key occupations in the office machine and computer industry are described briefly in the following section. (Detailed discussions of professional, technical, skilled, and other occupations found in this industry, as well as in many others, are given elsewhere in the *Handbook*, in sections covering individual occupations.)

Engineering and Scientific Occupations. Nearly 1 out of every 10 workers in the office machine and computer industry is an engineer or scientist. Most of them work at computer plants.

The largest group of engineers work with electricity or electronics. Most are engaged in research and development, although many work in production. The industry also employs large numbers of mechanical and industrial engineers. Some

mechanical engineers are engaged in product development and tool and equipment design. Others are concerned with the maintenance, layout, and operation of plant equipment. Industrial engineers determine the most effective means of using the basic factors of production-labor, machines, and materials.

Chemists make up the largest group of scientists in office machine and computer manufacturing. Their work is primarily in chemical processing of printed circuits used in computers. Mathematicians make up another large group of scientists. Their work on complex mathematical problems is important in designing computers. Physicists are employed in research and development to work on items such as miniaturized components and circuits. Statisticians work in fields such as quality control and production scheduling.

The industry also employs systems analysts and computer programmers, many of whom have scientific or engineering backgrounds. Systems analysts primarily devise new information processing techniques and improve existing techniques. Programmers design and test computer programs. Some analysts and programmers specialize in scientific and engineering problems, while others process accounting, inventory, sales, and other business data. Systems analysts and programmers may assist sales personnel in determining data processing needs of customers.

Technical Occupations. More than 1 out of every 20 workers in the industry is a technician. Most specialize in electronics and assist engineers and scientists in research and development, testing and inspecting electronic components, and doing complex assembly work. Some electronics technicians specialize in repairing computers. Chemical control technicians prepare solutions used in the etching of circuit boards. Photographic technicians set up cameras and other equipment used in the tracing process to create copper etchings on circuit boards. Drafters prepare drawings from sketches or specifications furnished by engineers. Engineering aids assist engineers by making calculations, sketches, and drawings, and by conducting performance tests on components.

Administrative and Sales Occupations. About 1 out of every 13 workers is an administrator. Included are top executives who manage companies and determine policy decisions and middle managers who direct departments such as advertising and industrial relations. Other administrative employees in staff positions include accountants, lawyers, and market researchers.

Sales personnel hold about 1 out of every 25 jobs in the industry. Those who sell conventional office machines usually work on their own. Computer sales personnel, on the other hand, are assisted by a host of technical experts, such as engineers and systems analysts. Because computers are complex and expensive, computer sales representatives may have to spend several months to complete a sale.

Clerical Occupations. Nearly 1 out every 6 workers in the industry is in a clerical job. Included in this group are secretaries, clerk typists, file clerks, bookkeepers, and business machine operators, as well as computer personnel such as keypunch and computer operators.

Plant Occupations. Nearly half of this industry's employees are plant (blue-collar) workers. Most plant workers are engaged directly in making computers and office machines. They include assemblers, inspectors or testers, machinists, machine tool operators, and their supervisors. Truckdrivers, material handlers, power truck operators, guards, and janitors move materials and perform custodial duties, and plumbers and pipefitters, electricians, carpenters, and other workers maintain production machinery and building facilities.

Assembly Occupations. (D.O.T. 590.885; 692.782; 706.884; 726.781 and .884) Workers who assemble computers and office machines have many different skills, and make up the largest group of plant workers.

Assemblers may put together small parts to make components or components to make sub-assemblies or the finished product. Much of their work is done by hand. Some assemblers do a single operation as components move down the assembly line. The assembly of typewriters, for example, is divided into many simple operations. Each assembler does one job as the typewriter passes the work station. Some assembly jobs are difficult and require great skill, while others are relatively simple. Skilled electronics assemblers, for example, use diagrams as guides to wire complex memory and logic panels for computers.

Machines are used for many assembly operations. Automatic wire-wrapping machines, for example, wire panels and plugboards. Operators feed these machines and remove and inspect finished items.

Electronic technicians usually do the most difficult hand assembly work. In research laboratories, they put together experimental equipment. In plants, they put together complex items that require a knowledge of electronics theory.

Assemblers commonly use screwdrivers, pliers, snippers, and soldering irons and they use special devices to position and hold parts during assembly. Some assemblers use precision equipment to weld connections in circuit assemblies.

Machining Occupations. Most office machine and computer manufacturing plants employ machining

workers who operate power-driven machine tools to produce plastic and metal parts for computers, typewriters, accounting machines, calculators, and other products. Numerical control machine operators tend machines that have been programmed to perform machining operations automatically. Toolmakers construct and repair equipment used to make and assemble parts. Diemakers specialize in metal forms (dies) used in punch and power presses that shape metal parts.

Inspection and Testing Operations. These operations begin when raw materials enter the plant and continue throughout the assembly process. Finished parts and products are tested and inspected thoroughly.

Some inspectors examine individual parts; others inspect components during subassembly; still others inspect completed office machines and computers. Many inspecting jobs require highly skilled workers. On the other hand, relatively unskilled people can run some automatic test equipment. Workers who feed or monitor this equipment are called test-set operators or testing machine operators.

Job titles indicate the work many inspectors do. *Machined parts inspectors* (D.O.T. 609.381) use precision testing instruments to determine whether parts have been machined properly. *Type inspectors* (D.O.T. 706.687) use a magnifying glass to examine typewriter type for defects. *Electronic subassembly inspectors* (D.O.T. 726.384) use microscopes, meters, and various measuring devices to examine circuits and other electronic subassemblies. *Electronic assembly inspectors* (D.O.T. 722.281) use special instruments to test electronic systems such as computer memory units.

In plants that manufacture conventional office machines, final inspection is relatively simple. Inspectors operate the machines, look for defects, and refer malfunctioning machines to repairers. The final inspection or "debugging" of computers, on the other hand, is very complex. Electronic technicians inspect new computers under the supervision of electronic engineers. They use complex equipment to run tests and detailed drawings and instructions to find causes of malfunctions.

Maintenance Occupations. Many maintenance workers with different types of training take care of the industry's production machinery and equipment. Skilled electricians are responsible for the maintenance of electrical equipment. Machine and equipment repairers make mechanical repairs. Maintenance machinists and welders build and repair equipment. Air-conditioning and refrigeration mechanics are employed in plants which are air-conditioned and have special refrigerated and dust-free rooms in order to maintain the equipment. Painters, plumbers, pipefitters, carpenters, and sheet-metal workers, and other building maintenance craft workers also are employed.

Other Plant Occupations. Many truckdrivers are employed to make deliveries to various parts of plants. Laborers load and unload trucks and boxcars and do general cleanup work. Some other plant occupations are boiler operator, stationary engineer, guard, and janitor.

Training, Other Qualifications, and Advancement

A bachelor's degree in engineering or one of the sciences is usually required for engineering and scientific jobs. For research and development work, applicants with advanced degrees generally are preferred. Some companies have training programs designed to give young college graduates a broad picture of manufacturing operations before they are assigned to a particular department. Because of the highly technical nature of computers, many of the industry's executives have backgrounds in engineering or science.

Engineers and scientists, as well as graduates of business administration and liberal arts colleges, are employed as sales workers, programmers, and systems analysts. Most business and liberal arts graduates, however, are employed in accounting, labor-management relations, and other administrative activities.

Technicians qualify for their jobs in a number of ways. Some obtain training in either a public, private, or Armed Forces technical schools. Others have one or more years of scientific or engineering training, but have not completed all of the requirements for a degree. Still other technicians are promoted from lower grade jobs in the plant and some well-qualified technicians may advance to engineering jobs after completing courses in mathematics, engineering, and related subjects.

People who complete commercial courses in high school or business school are preferred in clerical jobs such as stenographer or office machine operator. For computer operators, most firms prefer applicants who have some college or technical training in data processing. With additional training, some computer operators and clerical workers advance to programmer jobs.

In selecting workers for plant jobs, firms generally prefer high school or vocational school graduates, who are then trained through on-the-job instruction and experience that varies from a few days to years. Some plants also conduct classroom training of short duration. Skilled craft workers, such as machinists and tool and die makers, may spend 3 to 4 years in learning their jobs and some firms have formal apprenticeship programs, which include both on-the-job

training and classroom instruction related to the particular craft. Frequently, openings for skilled jobs are filled by qualified young workers already in the plant.

Workers who have little or no previous experience or training are hired for less skilled inspection, assembly, and machining jobs. Applicants may have to pass aptitude tests and demonstrate ability for particular types of work. Most assembly and inspection jobs require good eyesight and color perception, manual dexterity, and patience.

Experienced plant workers have opportunities to advance to jobs with higher pay. Assemblers, for example, can become semiskilled inspectors, and eventually skilled inspectors. Machine tool operators can move to skilled machinist jobs. Craft workers and skilled inspectors can become technicians, after completing courses in company-operated schools, junior colleges, or technical schools. Supervisory jobs are open to well-qualified plant workers who have leadership ability.

Employment Outlook

Employment in this industry is expected to increase much faster than the average for all industries through the mid-1980's. In addition to the job openings that result from employment growth, many openings will arise as experienced workers retire, die, or transfer to jobs in other industries.

Employment growth is expected to be concentrated in plants that produce electronic computer equipment as the demand for computers and related equipment continues to increase. As the economy expands and becomes more complex, computers will become increasingly useful to business, government agencies, and other organizations. Demand also will be stimulated as new uses for computers are developed. Growth in the number of computers will be accompanied by a need for additional computer-related equipment—input and output, storage, and communication devices.

Employment in plants that produce conventional office machines is expected to grow slowly. Most job openings will result from the need to replace experienced workers who retire, die, or transfer to other industries. The demand for most types of office machines is expected to rise rapidly as business and government organizations grow and the volume of paperwork increases. However, technological improvements in production methods are expected to increase output per worker. For example, increasing mechanization of operations formerly done by hand will tend to reduce labor requirements, particularly in plants where products are mass-produced, such as typewriters and calculators.

Some occupational groups in the office machine and computer manufacturing industry are expected to grow faster than others. For example, the number of professional and administrative workers, particularly engineers, scientists, and technicians, is expected to increase more rapidly than the number of plant workers. Demand for these workers will be spurred by continued high levels of research and development expenditures to improve production processes, advance machine capabilities, and broaden the use of computers for numerical controlled manufacturing.

Semiskilled production workers, such as assemblers and inspectors, will continue to account for most of the work force in plant occupations, despite the growing use of automated and mechanized assembly line equipment.

Earnings and Working Conditions

Earnings of plant workers in the office machine and computer industry are higher than the average for other manufacturing industries. In 1974, they averaged $4.64 an hour, compared with $4.40 an hour for plant workers in manufacturing industries as a whole.

National wage data are not available for individual occupations in the office machine and computer industry. However, the following tabulation, based on data obtained from a small number of union contracts, provides an example of the range in hourly wage rates for selected occupations in 1974:

	Hourly rate ranges
Assemblers	$3.03–4.46
Machinists	3.49–4.93
Inspectors	2.93–4.93
Tool and die makers	3.53–4.90
Electricians	3.34–4.48

Some employees work night shifts and weekends because many plants operate around the clock. Employees working second or third shifts, or more than 8 hours a day or 40 hours a week generally receive extra pay.

Paid vacations and holidays are almost universal in this industry. Most employees receive 1 to 4 weeks of vacation, depending on length of service. They also receive insurance and pension benefits at least partially financed by the employer. Employee stock purchase plans are available in many firms.

In general, the work surroundings in office machine and computer plants are more favorable than those in most other types of factories. Work stations usually are well-lighted and clean, and free from dust, fumes, and loud noises. Many computer factories are relatively new and are located in suburban areas.

Some plant jobs are repetitious, but very few require great physical effort. Fewer and less severe injuries take place in office machine and computer manufacturing than the average for all manufacturing.

Many plant workers are covered

by union contracts. The principal unions in this industry are the International Association of Machinists and Aerospace Workers; the International Union, United Automobile, Aerospace and Agricultural Implement Workers of America; the International Union of Electrical, Radio and Machine Workers; and the International Brotherhood of Electrical Workers.

Sources of Additional Information

For general information on the industry, write:

Computer and Business Equipment Manufacturer's Association, 1828 L. St. NW., Washington, D.C. 20036.

For general information on jobs in the industry, write to:

American Federation of Information Processing Societies, Inc., 210 Summit Ave., Montvale, N.J. 07645.

OCCUPATIONS IN THE PAPER AND ALLIED PRODUCTS INDUSTRIES

In 1974, the paper and allied products industry employed about 700,000 people to produce many different kinds of paper and paperboard products. The industry employs workers in occupations ranging from unskilled to highly specialized technical and professional jobs, many found only in the paper industry.

Nature and Location of the Industry

The paper industry is highly mechanized. Pulp, paper, and many finished paper products are manufactured by machines—some as long as a football field—in a series of nearly automatic operations that require very little handling of materials by workers. Manufacturing plants in the paper industry are engaged in one or more of three different operations: The production of pulp (the basic ingredient of paper) from wood, reused fibers, or other raw materials; the manufacture of paper or paperboard (thick paper) from pulp; or the conversion of rolls or sheets of paper or paperboard into finished products, such as tissue paper, envelopes, and boxes.

The largest group of employees in the industry works in mills that produce pulp, paper, or paperboard. The next largest group works in plants that make boxes and containers; and the remainder work in plants that make a variety of other paper products.

About four-fifths of the industry's employees work in factories which employ 100 workers or more.

Workers in this industry are located throughout the country, although about half are employed in eight States: New York, Pennsylvania, Ohio, Illinois, Wisconsin, California, Massachusetts, and New Jersey. Other States having large numbers of paperworkers are Michigan, Georgia, Washington, North Carolina, Alabama, Maine, Texas, and Florida.

Occupations in the Industry

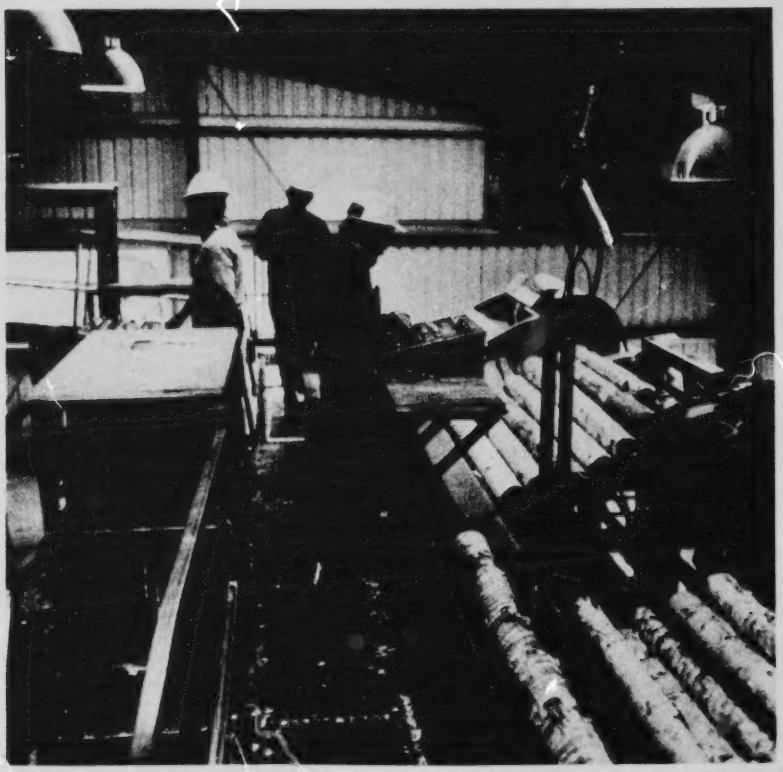
Employees in the paper industry work in a variety of occupations, requiring a broad range of training and skills. Many workers operate and control specialized papermaking, finishing, and converting machines. Some workers install and repair papermaking machinery. Truck drivers make deliveries, and other workers load and unload trucks, railroad cars, and ships.

The industry employs many workers in clerical, sales, and administrative occupations. For example, it employs purchasing agents, personnel managers, sales representatives, office clerks, stenographers, book-keepers, and business machine operators. Also, because of the complex processes and equipment used, the industry employs professional and technical workers, including chemical and mechanical engineers, chemists, laboratory technicians, and pulp and paper testers. (Detailed discussions of professional, technical, and mechanical occupations, found not only in the paper industry but in other industries, are given elsewhere in the *Handbook* in sections covering individual occupations.)

Production Jobs. In 1974, more than three-fourths of all employees in the industry worked in production jobs. The simplified description of papermaking occupations and processes that follows applies to a plant which combines the production of pulp, paper, and finished paper products into one continuous operation. (See accompanying chart.)

After logs are received at the pulpmill, the bark is removed. One machine used for this operation is a large revolving cylinder known as a "drum barker." Logs are fed mechanically into this machine by a semiskilled worker called a *barker operator* (D.O.T. 533.782). The machine cleans bark from the logs by tumbling them against each other and also against the rough inner surface of the drum. Next, pulp fibers in the logs are separated from other substances by a chemical or mechanical process, or both, depending on the type of wood used and the grade of paper desired.

In the mechanical process, pulpwood is held against a fast-revolving grindstone that separates the fibers. In the more commonly used chemical process, pulpwood is carried on conveyor belts to a chipper machine operated by a *chipper* (D.O.T. 668.885). The machine cuts the pulpwood into chips about the size of a quarter. These wood chips are "cooked" with chemicals under high temperature and pressure in a "digester," a kettlelike vat several stories high. Digesters are operated by skilled workers called *digester operators* (D.O.T. 532.782), who determine the amount of chemicals to be used and the cooking temperature and pressure. They also direct the loading of the digester with wood chips and chemicals. By checking an instrument panel, digester operators make certain that proper conditions



are being maintained. When the pulp fibers are removed from the digester, they are washed to remove chemicals, partially cooked chips, and other impurities. These fibers, called pulp, resemble wet, brown cotton.

Many modern plants are today making greater use of continuous digesters (equipment that produces pulp continuously rather than in separate batches). Continuous digesters make it practical to use sawdust in pulp-making, and eliminate the manual starting and stopping of each batch of pulp.

To turn pulp into paper, the pulp is mixed thoroughly with water and further refined in machines operated by skilled workers called *beater engineers* (D.O.T. 530.782). The kind and amount of chemicals and dyes they use and the length of time they "beat" the solution determines the color and strength of the paper.

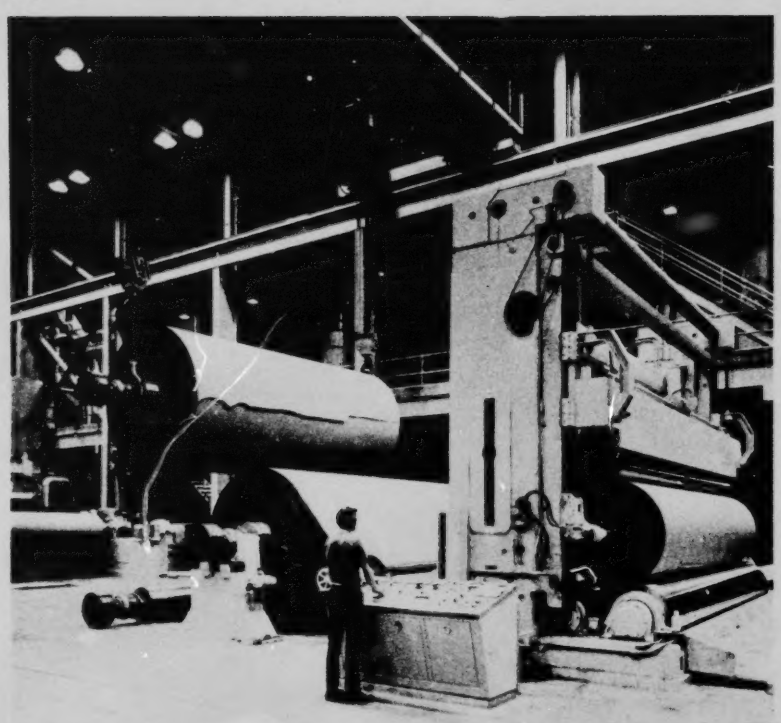
The pulp solution, now more than 99 percent water, is turned into paper or paperboard by machines which are among the largest in American industry. The machines are of two general types. One is the Fourdrinier machine, by far the most commonly used; the other is the cylinder machine used to make particular types of paper, such as building and container board. In the Fourdrinier, the pulp solution pours into a continuously moving and vibrating belt of fine wire screen. As the water drains, millions of pulp fibers adhere to one another, forming a thin wet sheet of paper. After passing through presses that squeeze out more water, the newly formed paper passes through the dryer section of the papermaking machine to evaporate remaining water.

The quality of the paper produced largely depends on the skills of *paper machine operators* (D.O.T. 539.782), who control the "wet-end" of the papermaking machine to form paper of specified thickness, width, and physical strength. They check control-panel instruments to make sure the flow of pulp and the speed of the machine are coordinated. Paper machine operators also determine whether the paper meets required specifications by interpreting laboratory tests or, in some instances, by visually checking or feeling the paper. They supervise the less skilled workers of the machine crew and, with their help, keep the paper moving smoothly through the machine.

Many modern papermills have papermaking machines which use computers and advanced instrumentation to help the operator control the quality of the paper. For example, beta-ray sensors measure the weight of the paper and electromagnetic sensors measure the thickness.

Backtenders (D.O.T. 532.885), who are supervised by paper machine operators, control the pressure and temperature of machinery that dries and finishes the paper and gives it the correct thickness. Backtenders inspect the paper for imperfections, and make sure that it is being wound tightly and uniformly into rolls. They also adjust the machinery that cuts the rolls into smaller rolls and, with the help of assistants, may weigh and wrap the rolls for shipment.

Papermills that produce a fine grade of paper for books, magazines, or stationary usually have finishing departments. Most workers in these departments are either semiskilled or unskilled. One semiskilled worker, the *supercalendar operator* (D.O.T. 534.782), aided by several helpers and by mechanical handling equipment, places huge rolls of paper onto a machine that gives the paper a smooth and glossy finish. The supercalendar operator also inspects the finished paper to make sure that specifications have been met. Another semiskilled worker, the



paper sorter and counter (D.O.T. 649.687), inspects sheets of paper for tears, dirt spots, and wrinkles; counts them; and may fill customer orders.

In converting plants, machines operated by semiskilled or skilled workers convert paper and paperboard into envelopes, napkins, corrugated shipping containers, and other paper products. Occupations in converting plants differ widely, depending largely on the product being manufactured. An example of a semiskilled worker is the *envelope machine operator* (D.O.T. 641.885) who feeds and tends an automatic machine that makes envelopes from either rolls of paper or prepared envelope blanks. One of the few skilled workers in a converting plant is the *printer-slotter operator* (D.O.T. 651.782) who controls a machine that cuts and creases paperboard sheets and prints designs or lettering on them.

Converting plants employ thousands of workers to print designs and lettering on bags, labels, wallpaper, and other paper products. Among these are compositors who set type, and press operators who prepare and operate printing presses.

Maintenance Jobs. The paper industry employs many skilled maintenance workers to care for its complex machinery and electrical equipment. *Millwrights* install and repair machinery. They also take apart and reassemble machines when they are moved about the plant. *Instrument repairers* install and service instruments that measure and control the flow of pulp, paper, water, steam, and chemical additives.

Other important maintenance employees include *electricians*, who repair wiring, motors, control panels, and switches; *maintenance machinists*, who make replacement parts for mechanical equipment; and *pipefitters*, who lay out, install, and repair pipes.

Stationary engineers are employed to operate and maintain powerplants, steam engines, boilers, air compressors, and turbines.

Professional and Technical Occupations. The complexity of pulp and paper manufacturing requires thousands of workers who have engineering, chemical, or other technical training. Approximately 15,000 scientists and engineers and 5,000 technicians were employed by the paper industry in 1974.

Many chemists are employed to control the quality of the product by supervising the testing of pulp and paper. In research laboratories, chemists study the influence of various chemicals on pulp and paper. In addition, some chemists and engineers are employed as sales representatives, supervisors of plantworkers, or as administrators in positions which require technical knowledge.

Chemical and *mechanical engineers* transform new pulp and papermaking techniques into practical production methods. Some chemical engineers supervise the production process. *Electrical engineers* supervise the operation of power-generating and distributing equipment and instruments.

Packaging engineers design containers and packages and supervise their production. A few box manufacturers also employ artists who develop letterings, designs, and colors for containers.

Foresters manage large areas of timberland and assist in the wood-buying operations of pulp and paper companies. They map forest areas, plan and supervise the harvesting, and seed or plant new trees to assure continuous production of timber.

Systems analysts and *computer programmers* are becoming increasingly important to this industry due to the greater use of computerized

controls in the production process. They analyze business and production problems and convert them to a form suitable for solution by computer.

Frequent tests are performed during the manufacture of pulp or paper to determine whether size, weight, strength, color, and other properties meet standards. Some testing is done by machine operators, but in many mills *testing technicians* are employed. These technicians, who have job titles such as laboratory technician, pulp tester, and chemical analyst, also assist engineers and chemists in research and development activities.

Administrative, Clerical and Related Occupations. The paper industry employs many administrative, clerical, and other office personnel. Executives plan and administer company policy. To work effectively, executives require information from a wide variety of personnel, including accountants, sales representatives, lawyers, and personnel in industrial relations, transportation, market research, and other activities. Bookkeepers, secretaries, shipping clerks, and other clerical workers keep records of personnel, payroll, inventories, sales, shipments, and plant maintenance.

Training, Other Qualifications, and Advancement

Paper and pulp companies generally hire and train inexperienced workers for production and maintenance occupations. Many companies prefer to hire high school graduates. Inexperienced workers usually start as laborers or helpers and advance along fairly well-defined paths to more skilled jobs.

Some large plants have formal apprenticeship programs for maintenance workers. Under these programs, which usually last 3 to 4 years, people are trained for jobs, such as machinist, electrician, millwright, and pipefitter. Generally, an applicant is given a physical examination, mechanical aptitude tests, and similar qualifying tests. Apprenticeship includes both on-the-job training and classroom instruction related to the occupation. The machinist apprentice, for example, receives classroom instructions in mathematics, blueprint reading, and shop theory.

A bachelor's degree is usually the minimum educational requirement for scientists, engineers, foresters, and other professional occupations. For research work, persons having advanced degrees are preferred. Many engineers and chemists (called *process engineers* and *paper chemists*) have specialized training in paper technology. A list of schools offering such training is available from the American Paper Institute, 260 Madison Ave., New York, N.Y. 10016. Many companies have summer jobs for college students specializing in papermaking, and upon graduation frequently hire them on a permanent basis. Some associations, colleges and individual companies offer scholarships in pulp and papermaking technology.

Some companies have formal training programs for college graduates with engineering or scientific backgrounds. These employees before being assigned to a particular department may work for brief periods in various parts of the plant to gain a broad knowledge of pulp and paper manufacturing. Other firms immediately assign junior chemists or engineers to a specific research, operation, or maintenance unit.

Generally, no specialized education is required for laboratory assistants, testing technicians, or other kinds of technicians. Some employers, however, prefer to hire technical institute or junior college graduates. Beginning technicians start in routine jobs and advance to positions of greater responsibility after they acquire experience and can work with minimum supervision.

Administrative positions usually are filled by people who have college degrees in business administration, marketing, accounting, industrial relations, or other specialized business fields. A knowledge of paper technology is helpful for administrators and sales occupations. This is true especially for sales representatives who give customers technical assistance. Most pulp and paper companies employ clerks, bookkeepers, stenographers, and typists who have had commercial courses in high school or business school.

For production workers, promotion generally is limited to more skilled jobs within a "work area," which may be a department, section, or an operation on one type of machine. These promotions may take years, depending on the availability of jobs. Experience gained within a work area usually is not transferrable; unskilled or semiskilled workers who transfer to jobs outside their seniority-area or to other plants usually must start in entry jobs.

Many plant supervisors are former production workers. In some plants, qualified workers may be promoted directly to supervisory positions. In others, workers are given additional training before they are eligible for promotion. This training often is continued after the worker is promoted—through conferences, special plant training sessions, and courses at universities or trade schools. Most firms provide some financial assistance for employees who take courses outside the plant.

Employment Outlook

Employment in the paper and allied products industry is expected to increase more slowly than the average for all industries through the mid-1980's. Although a significant number of job openings is ex-

pected due to growth, most openings will stem from the need to replace workers who retire, die, or leave their jobs for other reasons. The number of job openings may fluctuate from year to year, however, because the demand for paper is somewhat sensitive to changes in economic conditions.

Paper production is expected to increase over the long run as population and business activity grow and new uses for paper are developed. Employment will grow at a slower rate than production, however, because of the greater use of laborsaving machinery. Most of the employment growth will occur in plants that make finished products such as napkins, envelopes, boxes, and wrapping paper. These plants are not as suited for laborsaving machinery as plants that produce pulp and unfinished paper products.

Occupational groups within the industry are expected to grow at different rates. The number of engineers, scientists, technicians, and maintenance workers is expected to increase faster than other occupational groups in the industry. More scientific and technical personnel will be needed as research and development activities expand, and more maintenance workers will be required to service the more complex machinery. Employment of administrative and clerical workers also is expected to rise at a faster pace than total employment. On the other hand, the number of production workers may decline slightly as more laborsaving machinery is introduced. Nevertheless, replacement needs will create many job openings for production workers.

Earnings and Working Conditions

Production workers in the paper industry had average earnings of $4.50 an hour in 1974. In the same year, production workers in all manufacturing industries averaged $4.40 an hour.

The following tabulation, based on information from a score of union-management contracts in the paper industry, illustrates the approximate range of hourly wage rates for selected production and maintenance occupations in 1974. Local rates within these ranges depend on geographic location, type and size of mill, kinds of machines used, and other factors.

	Hourly rate ranges
Production occupations:	
Paper machine operator	$4.85–7.99
Backtender	4.43–7.54
Head stock preparer (beater engineer)	4.48–6.13
Digester operator (cook)	4.61–6.09
Supercalendar operator	5.07–5.69
Barker operator, drum	4.13–4.87
Chipper	4.12–4.61
Maintenance occupations:	
Pipefitter	4.46–5.88
Electrician	4.26–5.88
Machinist	4.26–5.88

Most pulp and paper plants operate around the clock—three shifts a day, 7 days a week. Production workers can expect to work on evening or night shifts from time to time. Maintenance workers usually are employed on the regular day shift.

In most plants the standard workweek is 40 hours; in a few it is 36 hours or less. Workers normally have year-round employment because paper production is not subject to seasonal variations.

Most pulp and papermaking jobs do not require strenuous physical effort. However, some employees work in hot, humid, and noisy areas. They also may be exposed to disagreeable odors from chemicals in the papermaking process. The rate of injury in this industry has been about the same as the rate for all manufacturing.

A majority of the production workers are members of trade unions. The largest unions in the industry are the United Papermakers and Paperworkers and the International Brotherhood of Pulp, Sulphite and Paper Mill Workers. Many other workers in the Western States, are represented by the Association of Western Pulp and Paper Workers. Many printing workers belong to the International Printing and Graphic Communications Union. Some maintenance and craft workers belong to various craft unions.

Sources of Additional Information

Further information about job opportunities in this industry is available from local offices of the State employment service and from:

American Paper Institute, 260 Madison Ave., New York, N.Y. 10016.

Fibre Box Association, 224 S. Michigan Ave., Chicago, Ill. 60604.

National Paper Box Manufacturers Association, Inc., 121 N. Broad St., Philadelphia, Pa. 19107.

Paper Industry Management Association, 2570 Devon Ave., Des Plaines, Ill. 60018.

For information on job opportunities for paper and paper products sales representatives, write to:

National Paper Trade Association, Inc., 420 Lexington Ave., New York, N.Y. 10017.

OCCUPATIONS IN THE PETROLEUM REFINING INDUSTRY

The petroleum and natural gas industries provide about three-fourths of the Nation's energy needs. Crude oil products supply the fuels and lubricants used for motor vehicles, locomotives, aircraft, and ships. Oil and gas provide much of the heat for homes, factories, and stores, as well as the fuel for the generation of over one-quarter of our electric power. In addition, basic petroleum compounds are used to manufacture hundreds of everyday products such as synthetic rubber, fertilizers, and plastics.

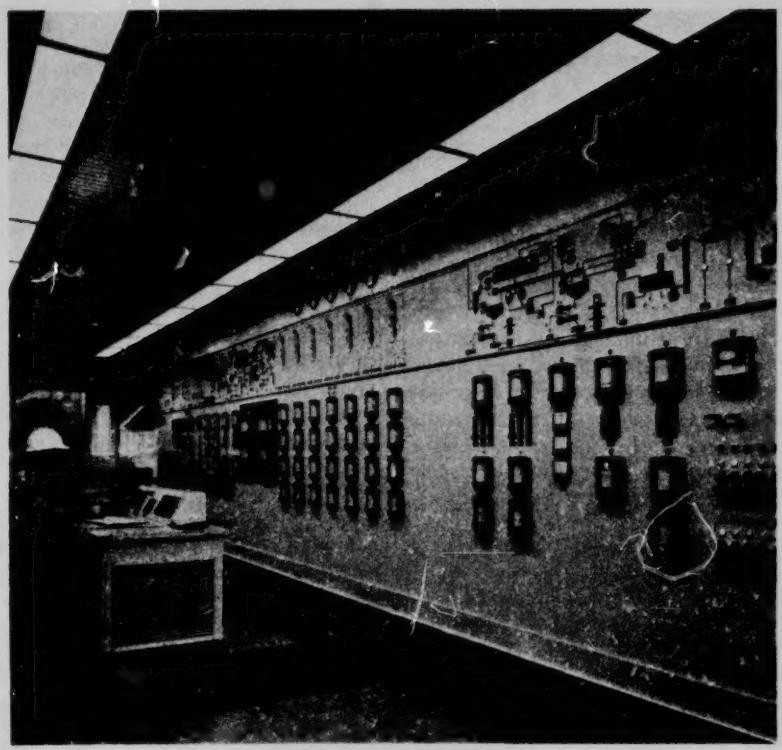
In 1974 about 155,000 workers, who had a wide range of educational backgrounds and skills, were employed in the petroleum refining industry. This industry covers occupations and activities involved in refining oil. Occupations in petroleum and natural gas production and processing are discussed in a separate chapter elsewhere in the *Handbook*.

Nature and Location of the Industry

A modern refinery is a complicated plant made up of tanks and towers connected by a maze of pipes and valves. From the time crude oil enters the refinery to the shipment of finished products, the production flow is almost continuous. Operators use instruments including computers to measure and regulate the flow, volume, temperature, and pressure of liquids and gases going through the equipment. Manual handling of materials is virtually eliminated.

The first step in petroleum refining consists of heating crude oil as it flows through a series of pipes in a furnace. The vapors from the heated oil pass into a tower where the various "fractions," or parts, of the oil are condensed. The heaviest parts (for example, heavy fuel oils and asphalt) are drawn off along the bottom of the tower where temperatures are highest; lighter parts (jet fuel and diesel fuel) are drawn off along the middle of the tower; and the lightest (gasoline and gases) are taken off at the top where temperatures are lowest. Further processing by more complicated methods combines or modifies compounds obtained through fractionating. Treating units are used to remove water, sulfur compounds, and other impurities.

About 600 refineries were in operation in 1974. They ranged in size from plants with fewer than three employees to those with several thousand. Although many States have refineries, about 85 percent of the workers were employed in 10 States: Texas, California, Illinois, Pennsylvania, Louisiana, New York, New Jersey, Ohio, Oklahoma, and Indiana. Refineries usually are located near oilfields, industrial centers, or deepwater ports where tankers can dock.



Operator observes central controls for a refinery.

Refinery workers are among the highest paid employees in manufacturing.

Occupations in the Industry

About 1 out of every 2 workers in a refinery is an operator. A key worker in converting crude oil into usable products is the *refinery operator* (D.O.T. 542.280), or chief operator, who is responsible for one or more processing units. The refinery operator, with help from assistant operators, makes adjustments for changes in temperature, pressure, and oil flow. In modern refineries, operators can monitor instruments on panels that show the entire operation of all processing units in the refinery. They also patrol units to check their operating condition.

Other plantworkers may include *still pump operators* (D.O.T. 549.782), also known as pumpers, and their *helpers* (D.O.T. 549.884), who maintain and operate pumps that control all production throughout the refinery; and *treaters* (D.O.T. 549.782), who operate equipment to remove impurities from gasoline, oil, and other products. In automated plants, computers may do the work of pumpers and treaters. Operators monitor the computers to spot potential problem areas, and may make routine checks of the refinery to make sure that valves are operating properly.

Many refineries employ large numbers of maintenance workers to repair, rebuild, replace, and clean equipment. In other plants, maintenance work is contracted to companies outside the petroleum industry. Maintenance workers are needed because high heat, pressure, and corrosion quickly wear out the complex refining equipment. Included are skilled boilermakers, electricians, instrument repairers, machinists, pipefitters, sheetmetal workers, and welders. Helpers and apprentices also are in these trades. Some skilled workers have a primary skill in one craft as well as the ability to handle closely related crafts. For example, a pipefitter also may be a boilermaker and a welder. Maintenance workers who have such combined jobs are sometimes called refinery mechanics.

Plantworkers who do not operate, monitor, or maintain equipment do many other tasks. Some workers drive delivery trucks; some load and unload materials on trucks, trains, or ships; and others keep stock and tool inventory records. The industry also employs service workers such as guards and janitors.

About 12 percent of the workers in petroleum refining are scientists, engineers, and technicians. Among these are chemists, chemical engineers, mechanical engineers, waste treatment engineers, laboratory technicians, and drafters. Chemists and laboratory technicians control the quality of petroleum products by making tests and analyses to determine chemical and physical properties. Some chemists and chemical engineers develop and improve products and processes. Laboratory technicians assist chemists in research projects or do routine testing and sample taking. Some engineers design chemical processing equipment and plant layout, and others supervise refining processes. Waste treatment engineers and technicians supervise and improve treatment and disposal of refinery waste waters and gases. Drafters prepare plans and drawings needed in refinery construction and maintenance.

Refining companies employ many administrative, clerical, and other white-collar personnel. Administrative workers include managers, accountants, purchasing agents, lawyers, computer programmers, computer analysts, and personnel and training specialists. Typists, secretaries, bookkeepers, keypunch operators, and business machine operators assist administrative workers. (Detailed discussions of professional, technical, mechanical, and other occupations found not only in petroleum refining but also in other industries are presented elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

New plantworkers usually begin as aides in a labor pool where they move materials, pack cartons, fill barrels, and do maintenance work. They may be transferred to the processing department or maintenance shop when a vacancy occurs. Aptitude testing and interviewing frequently are used in selecting applicants for plant jobs.

Workers newly assigned to a processing department learn to operate equipment under experienced operators. Formal training courses frequently are given in plant operation.

A supervisor trains inexperienced workers in the maintenance shop. Some refineries have classroom instruction related to particular work. After 3 or 4 years, a person may advance from helper to skilled craft worker in one of the maintenance crafts. Some large refineries train

workers in several crafts. For example, a qualified instrument repairer may be given electrician or machinist training.

For scientists and engineers, a bachelor's degree in an appropriate field usually is the minimum educational requirement. Advanced degrees are preferred for research work.

For most laboratory assistant jobs, 2-year technical school training is required. Laboratory assistants begin in routine jobs and advance to positions of greater responsibility as they acquire experience and learn to work without close supervision. Inexperienced drafters begin as copyists or tracers and can advance to more skilled drafting jobs.

Administrative positions generally are filled by people who have college degrees in science and engineering, accounting, business, industrial relations, or other specialized fields. For positions as clerks, bookkeepers, secretaries, and typists, most refineries employ persons who have had commercial courses in high school or business school. For occupations associated with computers, educational requirements range from a high school level for keypunch operators to a college degree in the physical science field for analysts.

Employment Outlook

Employment in petroleum refining is expected to show little change through the mid-1980's. Refinery output is expected to increase to meet the Nation's growing demand for petroleum products, but automated, computerized plants, increased refining capacity, and improved refining techniques should make it possible for the industry to increase production without increasing employment significantly. Nevertheless, thousands of job openings will result from the need to replace workers who retire, die, or transfer to other occupations.

Most jobs will be for operators, maintenance workers, administrators, and technicians. More maintenance workers, such as electricians, pipefitters, and instrument repairers, will be needed to take care of the increasing amount of automated equipment and complex control instruments.

Earnings and Working Conditions

Refinery workers are among the highest paid employees in manufacturing. In 1974 production workers in petroleum refining averaged $5.96 an hour, compared with an average of $4.40 an hour for production workers in manufacturing industries as a whole. Refinery workers have better-than-average earnings because a large proportion are skilled.

Entry salaries for chemical engineers in the petroleum refining industry were among the highest in American industry, according to a survey conducted by the College Placement Council in 1974. The average monthly salary for chemists who had a bachelor's degree and no experience was $966, and for chemical engineers $1,177.

Because petroleum is refined around the clock, operators may be assigned to any one of the three shifts, or they may be rotated on various shifts. Some operators work weekends and get days off during the week. Employees usually receive additional pay for shift work. Most maintenance workers are on duty during the day.

Most refinery jobs require only moderate physical effort. A few workers, however, have to open and close heavy valves and climb stairs and ladders to considerable heights. Others may work in hot places or may be exposed to unpleasant odors. Refineries are relatively safe. The injury frequency rate has been less than half the rate for manufacturing as a whole.

Many refinery workers are union members and belong to the Oil, Chemical and Atomic Workers International Union. Some refinery workers are members of AFL-CIO craft unions or of various independent unions.

Sources of Additional Information

More information on job opportunities in the petroleum refining industry may be obtained from the personnel offices of individual oil companies. General information on jobs in the industry is available from:

National Petroleum Refiners Association, 1725 DeSales St. NW., Washington, D.C. 20036.

OCCUPATIONS IN THE PRINTING AND PUBLISHING INDUSTRY

Printing is both an art and one of our chief means of communication. In 1974, the printing and publishing industry employed about 1.1 million workers. Government agencies and private firms that do their own printing, such as banks and insurance companies, also employed thousands of printing workers.

Nature and Location of the Industry

Included in the industry are the printing and publishing of newspapers, magazines, books, and advertising matter; the production of business forms, greeting cards, and gift wrappings; commercial or job printing; bookbinding; and typesetting, photoengraving, platemaking, and other printing services, primarily for printing establishments.

In 1974, the largest division in terms of employment was newspaper printing and publishing, with over 380,000 employees. Most daily and many weekly newspapers throughout the Nation do their own printing. Although some major newspapers have more than 2,000 employees, many have fewer than 20.

Commercial printing shops, the second largest division of the industry, employed about 362,000 workers. These shops produce a variety of materials, including advertising matter, business cards, calendars, catalogs, labels, maps, and pamphlets. They also print limited-run newspapers, books, and magazines. Many commercial shops have several hundred workers, but employment is concentrated in smaller shops.

Printing jobs are found throughout the country. Almost every town has at least one printing shop, frequently, a small newspaper plant that also may do other printing. However, about one-half of the Nation's printing employees are in five States—New York, Illinois, California, Pennsylvania, and Ohio. Within these States, most printing activities are in or near manufacturing, commercial, or financial areas such as New York, Chicago, Los Angeles, Philadelphia, San Francisco-Oakland, Cincinnati, and Cleveland. Other leading centers of printing are Boston, Detroit, Minneapolis-St. Paul, Washington, D.C., St. Louis, and Baltimore. Employment in book and magazine printing is highly concentrated in these areas. A much larger proportion of newspaper employment, however, is found outside these centers because of the great number of small local newspapers.

Printing Methods

Printing is a means of transferring ink impressions of words and pictures to paper, metal, or other materials. A plate of metal, rubber, or plastic is prepared so that part of it can be covered with ink. The ink is then transferred to a sheet of paper or other material that is pressed against the plate.

In relief printing, the letters and images are raised from the rest of the printing plate. Ink is rolled over the raised surface and then paper is pressed against it. In gravure printing, the image is etched into the surface of a cylinder. The whole surface is covered with ink and then wiped off; ink is left only in the sunken or etched areas. When paper is pressed against the surface, the ink is lifted out and appears on the paper. In lithography (offset printing), the printing plate surface is smooth, with both image and nonimage areas on the same level. Lithography is based on the principle that grease and water do not mix. The plate's image areas are coated with a substance to make the greasy printing ink stick to the plate and then moistened with water so that only the image areas take up the ink. The inked image is transferred from the plate to a rubber blanket and then to the paper.

Screen printing is a method in which inks or other materials such as paint and varnish are forced through a stencil mounted on a finely woven screen. The shape of the stencil openings determines the design to be printed. This process may be applied to a variety of surfaces such as paper, glass, metal, plastic, and textiles.

Printing Occupations

Production of printed materials requires workers in a wide variety of occupations. Printing craft workers represent a large segment of these employees. They usually specialize in one area of printing operations: Type composition, photography, platemaking, presswork, or binding. Their training generally is confined to only one of the basic printing methods—letterpress, lithography, or gravure. Some of the principal printing crafts are briefly described below. Detailed information on these crafts is presented in the section on printing occupations, elsewhere in the *Handbook*.

The printing process begins in a composing room where manuscript copy is set in type, proofed, and

checked for errors. Machine and handset type and other materials such as photoengravings are assembled there and prepared for the pressroom.

In 1974, about 40 percent of all printing craft workers—165,000—were employed in composing room occupations. This group includes *compositors* (D.O.T. 973.381) who set type by hand or machine; *typesetter perforator operators* (D.O.T. 208.588) who punch tapes used to operate some typesetting machines; *make-up arrangers* (D.O.T. 973.381) who assemble type in shallow trays called "galleys" and make trial copy of this type; and *proofreaders* (D.O.T. 209.688) who check the trial copy with the original copy for errors.

Electrotypers and stereotypers (D.O.T. 974.381 and 975.782) make duplicate pressplates of metal, rubber, and plastic for letterpress printing. These plates are made from the metal type forms prepared in the composing room. Electrotypes are used mainly in book and magazine work. Stereotypes, which are less durable, are used chiefly in newspaper work.

Photoengravers (D.O.T. 971.381) make metal printing plates of illustrations and other copy that cannot be set up in type. The printing surfaces on these plates stand out in relief above the nonprinting spaces, as do the letters and the accompanying type. Similarly, *gravure photoengravers* (D.O.T. 971.381), a specialized type of photoengravers, make gravure cylinders in which the image is etched below the surface for use in reproducing pictures and type.

The actual printing operation is performed in the pressroom. *Printing press operators* (D.O.T. 651.782, .885 and .886) prepare type forms and pressplates for final printing and tend the presses while they are in operation. Small commercial shops generally have small and relatively simple presses that often are fed paper by hand. At the other extreme are the enormous presses used by the larger newspaper, magazine, and book printing plants. They automatically print the paper and cut, assemble, and fold the pages. These machines are operated by crews of press operators assisted by less skilled workers.

Lithography (offset printing) is growing in importance. Practically all items printed by other processes also can be produced by lithography. It is a process of photographing the matter to be printed, making a printing plate from the photograph and pressing the inked plate against a rubber blanket which in turn presses it onto the paper. Several operations are involved in lithography, and each is performed by a specialized group of workers. The main group of lithographic workers are *camera operators* (D.O.T. 972.382), *artists and letterers* (D.O.T. 971.281), *strippers* (D.O.T. 971.381), *platemakers* (D.O.T. 972.381), and *press operators* (D.O.T. 651.885).

Because of the increasingly complex and highly mechanized printing equipment in use today, technically trained people are needed in all areas of printing management and production. For example, an increasing number of *production technicians* (D.O.T. 019.281) are employed to see that the standards for each printing job are met.

Many printed items, such as books, magazines, pamphlets, and calendars, must be folded, sewed, stapled, or bound after they leave the printing shops. Much of this work is done by skilled bookbinders. In many binderies, however, the work is done mostly by semiskilled assemblers.

Besides printing craft workers, the industry employs people in a variety of other occupations. Many mailroom workers are employed in newspapers and magazine plants to address, bundle, and tie the printed matter for distribution. Modern mailroom processes are mechanized to a considerable extent. Mailers operate addressing, stamping, stacking, bundling, and tying machines. Many large printing firms employ mechanics and machinists to repair and adjust typesetting machines, printing presses, and other equipment.

Printing firms employ a great many people as executives, sales representatives, accountants, engineers, computer programers, stenographers, clerks, and laborers. Newspapers and other publishers employ a considerable number of reporters, editors, and photographers. These occupations are discussed elsewhere in the *Handbook*.

Training and Other Qualifications

Many training authorities recommend apprenticeship as the best way to learn printing trades. A substantial number of people, however, learn these trades by working as helpers or through a combination of work experience and schooling. Apprentices often are chosen from among people already employed in various unskilled jobs in printing plants.

Printing apprenticeships usually last from 4 to 6 years, depending on the occupation and shop or area practices. The apprenticeship programs cover all phases of a particular trade and generally include classroom or correspondence study in related technical subjects, as well as on-the-job training. Apprenticeship applicants generally must be at least 18 years of age and pass an aptitude test and a physical examination. Applicants who qualify may be put on a waiting list if there are no immediate apprenticeship job openings.

Most employers prefer applicants to have a high school education or its equivalent. A thorough

knowledge of spelling, punctuation, the fundamentals of grammar, and basic mathematics is essential in many of the printing trades. A knowledge of the basic principles of chemistry, electronics, and physics is becoming increasingly important because of the growing use of photomechanical and electronic processes in printing.

Most printing crafts require people with good eyesight, about average physical strength, and a high degree of manual dexterity. Alertness, patience, and the ability to work with others also are necessary. The ability to distinguish colors is important in areas of printing where color is used. An artistic sense also is an asset since the finished product should be pleasing in balance and design.

About 4,000 schools—high schools, vocational schools, technical institutes, and colleges—offer courses in printing technology. These courses may help a person to be selected for apprenticeships or other job openings in the printing and publishing industry.

Administrative jobs are usually filled by upgrading experienced people. Many owners and production managers of printing firms have come from the ranks of printing craft workers. In recent years, however, more firms are filling administrative positions with people who have college degrees in business administration, marketing, accounting, industrial relations, or other specialized business fields. Most firms hire clerks, bookkeepers, stenographers, and typists who have completed commercial courses in high school or business school.

Some computer programmers in the printing industry have technical school training; others learn their skills on the job. Also, many compositors and typesetters are being taught computer programming skills, and the International Typographic Union has established a training center for this purpose.

Employment Outlook

Employment in the printing and publishing industry is expected to grow more slowly than the average for all industries through the mid-1980's. Most job openings will occur from the need to replace experienced workers who retire, die, or transfer to other industries.

The volume of printed materials is expected to increase rapidly because of population growth, the increasingly high literacy level of the population, and the trend to greater use of printed materials for information, packaging, and various industrial and commercial purposes. Employment will grow at a slower rate than the volume of printing, however, because of laborsaving technological changes in printing methods.

Occupational groups in the industry are expected to increase at different rates. Employment of technical, maintenance, and clerical workers will increase at a faster pace than total employment. Employment growth will vary among the printing crafts. The number of lithographic craft workers, for example, is expected to increase because of the growing use of lithography. On the other hand, since lithography does not require photoengraving, employment of photoengravers is expected to decline. The trend to computerization of typesetting operations will reduce the need for some machine operators in composing rooms while creating a demand for more computer programmers. More mechanics will be hired to maintain the industry's increasingly complex machinery.

Earnings and Working Conditions

Earnings of production workers in the printing and publishing industry are among the highest in manufacturing. In 1974, they averaged $4.96 an hour, while those in manufacturing industries as a whole averaged $4.40.

The accompaying tabulation shows the average estimated union minimum hourly rates for selected printing occupations in 1974 based on a survey of 69 large cities. These are the minimum basic rates for daywork, and do not include overtime, other special payments, or bonuses.

Most printing craft workers who are covered by union contracts work fewer than 40 hours a week. Some contracts specify a standard workweek of less than 35 hours, but most fall within a 35 to 37-1/2 hour range. Time and a half generally is paid for overtime. Work on Sundays and holidays is paid for at time and one-half or double-time rates in most commercial printing firms. In newspaper plants, however, the workweek often includes Sundays. Time and one-half or double time is paid for these days only when they are not part of the employee's regular shift. Night-shift workers generally receive pay differentials above the standard day rates.

The starting wage rates of apprentices generally are from 40 to 50 percent of the basic rate for skilled workers in the shop. Wages are increased periodically, usually every 6 months, until the apprentice reaches the skilled rate.

The injury-frequency rate in the printing industry is somewhat lower than the average for all manufacturing industries.

A large proportion of the printing trades workers are members of unions. Among these are the Graphic Arts Union, International the International Printing and Graphic Communication's Union America, the International Typographical Union, and the International Mailers Union.

Sources of Additional Information

Details about employment opportunities and apprenticeships

	Average minimum hourly rate, 1974	
	Newspaper	Book and job shops
Bookbinders	—	$6.63
Compositors:		
Hand	$6.86	7.11
Machine operators	6.97	6.97
Electrotypers	—	6.22
Photoengravers	7.27	—
Press operators	6.74	—
Press (cylinder) operators	—	6.73
Press (platen) operators	—	5.86
Stereotypers	6.69	6.78

may be obtained from local employers, such as newspapers and printing shops, local offices of the unions mentioned above, or the local office of State employment services. Some State employment service offices screen applicants and give aptitude tests.

For general information on the industry, write to:

American Newspaper Publishers Association, 11600 Sunrise Valley Dr., Reston, Va. 20041.

American Photoplatemakers Association, 166 W. Van Buren St., Chicago, Ill. 50604.

Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213.

Gravure Technical Institute, 60 E. 42 St., New York, N.Y. 10020.

International Typographical Union, P.O. Box 157, Colorado Springs, Colo. 80901.

Printing Industries of America, Inc., 1730 N. Lynn St., Arlington, Va. 22201.

(See the section on Printing Occupations elsewhere in the *Handbook* for names of labor organizations and trade associations that can provide more information on specific printing trades.)

TRANSPORTATION, COMMUNICATIONS, AND PUBLIC UTILITIES

The transportation, communications, and public utility industries produce most of the energy that powers, heats, and lights our factories and homes. The transportation industry moves goods and people by air, rail, water, and highway; the communications industry provides communications systems such as telephones and radio and TV broadcasting. Other public utilities supply the Nation with electricity, gas, and sanitation services.

Transportation, communications, and public utility firms are semipublic in character. Some State and local governments operate their own transit lines or electric companies as well as other types of utilities. Privately owned transportation and public utility firms are regulated closely by commissions or by other public authorities to make sure they operate in the public interest.

In 1974, almost 4.7 million people worked in the transportation, communications, and public utility industry division. In addition, more than one-half million persons held jobs with State and local governments in publicly owned transit and utility systems. Almost half of the workers in this industry division worked in two major industry groups: communications employing 1.2 million workers ; and motor freight transportation and warehousing (including local and long-distance trucking); employing over 1 million workers.

Electric, gas, and sanitary services companies employed nearly 750,000 workers and railroads over 580,000. Other industries employing a significant number of workers were air transportation and local and interurban passenger transit. The remaining workers were employed by firms that provide water and pipeline transportation and transportation services.

As shown in the accompanying tabulation, blue-collar workers (craft workers, operatives, and laborers) made up three-fifths of total employment in the transportation, communications, and public utility industries in 1974. Operatives alone accounted for about one-fourth of the total. Most of these semiskilled workers are truck, bus, and taxi drivers, and railroad brake operators. Craft workers made up nearly one-fourth of the total. Among the occupations in this group are airplane mechanic, motor vehicle mechanic, telephone line installer, locomotive engineer, and the supervisors of blue-collar workers. A relatively small fraction of the industry's employees were laborers, such as material handlers and truckdrivers' helpers.

Nearly two-fifths of the industry's employees were white-collar workers (professional, managerial, clerical, and sales). Most of the white-collar workers were in clerical occupations such as telephone operator, ticket agent, secretary, and bookkeeper. These industries employed about an equal number of managerial workers and professional and technical workers. Many of the professional and technical workers are in the communications industry, where, in addition to large numbers of engineers and technicians, many actors, entertainers, and writers are employed.

Major occupational group	*Percent of workers*
All workers	100
Professional, technical, and kindred workers	7
Managers and administrators	8
Clerical and kindred workers	23
Salesworkers	1
Craft and kindred workers	23
Operatives	26
Service workers	3
Laborers	9

Employment in the transportation, communications, and public utility industries is expected to increase more slowly than the average for all industries through the mid-1980's. In addition to openings resulting from growth of the industries, many thousands of jobs will be available each year because of the need to replace workers who die, retire, or transfer to other industries.

Employment growth in individual industries will vary. Rising population and business expansion will stimulate employment growth in air transportation and in trucking. On the other hand, little employment change is expected in local and interurban passenger transportation (buses, taxis, and subways). The longrun decline in railroad employment is expected to continue, but at a decreasing rate.

Employment in communications is expected to grow at about the same rate as the average for all in-

dustries through the mid-1980's. Although demand for the industry's services will increase rapidly, advances in technology are expected to limit employment growth, particularly in telephone communications. Computers and other electronic equipment are expected to be applied increasingly to work previously done by wage earners. Employment in electric and gas utilities also will be affected strongly by advancing technology and will grow more slowly than increases in output.

The statements that follow cover major industries in the transportation, communications, and public utility fields. More detailed information about particular occupations in these fields appears elsewhere in the *Handbook*.

CIVIL AVIATION

The rapid development of air transportation has increased the mobility of the population and has created many thousands of job opportunities in the civil aviation industry. In 1974 over 450,000 people were employed in a variety of interesting and responsible occupations in this industry.

Characteristics of the Industry

Many different organizations and activities are involved in civil aviation. The most familiar are airlines that provide transportation for passengers and cargo. Airlines account for more than three times as much intercity passenger travel as buses and railroads combined.

The civil aviation industry includes other kinds of flying activities. For example, many businesses transport executives in company planes and some firms use their own planes for crop dusting, inspecting pipelines, and other activities. The government-licensed shops which repair and inspect smaller airplanes also are included in the industry.

The Federal Aviation Administration (FAA) and the Civil Aeronautics Board (CAB)—both part of the Federal Government—regulate the civil aviation industy. The FAA develops air safety regulations, coordinates flights, operates ground navigation equipment, and licenses personnel such as pilots and aircraft mechanics. The CAB makes policy on airline rates and routes.

In 1974, about 325,000 employees worked for airlines. Most of the remaining civil aviation employees worked for firms that operate airplanes to transport executives and for firms that rent, service, or repair aircraft. The rest worked for the Federal Government; in 1974, the FAA employed about 56,000 people, the CAB less than 1,000.

About half of all airline employees work at airports near New York, Miami, Los Angeles, San Francisco, Chicago, Atlanta, and Dallas, the cities where major airlines are based. Others work at airports scattered throughout the country. Most other civil aviation employees work at airports near large cities.

Civil Aviation Occupations

About four-fifths of all civil aviation employees work in ground occupations. Many of these are mechanics and aircraft maintenance personnel who refuel, clean, inspect, and repair the planes between flights. Other large groups make reservations and sell tickets for the airline companies. Some are air traffic controllers and flight service specialists for the FAA. Other groundworkers include cargo and freight handlers, dispatchers, and clerical, administrative, and professional personnel.

Flight crewmembers make up the remaining one-fifth of civil aviation employment. They include the pilots who fly the planes and the flight attendants who assist passengers. Detailed discussions of most of the principal occupations in civil aviation are presented elsewhere in the *Handbook* in the section on Air Transportation Occupations.

Training, Other Qualifications, and Advancement

Jobs are available to persons with a wide variety of training and backgrounds. Although some jobs require previous training and may require certificates from the FAA. Others can be learned on the job.

Pilots usually have an air transport or commerical pilot's license from the FAA when they begin work. They also must have an instrument license to fly when the weather is bad. As a rule new airline pilots begin as flight engineers.

Interested persons may obtain pilot training from military or civilian flying schools. Physical requirements are high. With or without glasses, they must have 20/20 vision, good hearing, and no physical handicaps that prevent quick reactions. In addition, airlines generally require 2 years of college and prefer college graduates. Before qualified pilots can fly as a flight engineer, they must obtain a flight engineer's license from the FAA.

Although most flight attendants are women, airlines permit men and women to compete equally for available jobs. Applicants must be in excellent health, and those who have some college and have experience in dealing with the public are preferred. Applicants are trained for their jobs at company schools.

When hiring airplane mechanic trainees or apprentices, employers prefer high school or trade school graduates who are in good physical condition. Experience in automotive repairs or other mechanical work also is helpful. Most mechanics remain in the maintenance field, but they may advance to head mechanics, inspectors, and in a few cases, to supervisory and executive positions. Some jobs require aircraft mechanics to be certified by the FAA as an airframe mechanic, a powerplant mechanic, or both.

New reservation, ticket, and passenger agents are trained by the company. A good speaking voice and a pleasant personality are necessary, because such personnel deal directly with the public. A high school education is required.

Air traffic controllers are selected through the competitive Federal Civil Service System. Applicants must pass a rigid physical examination and a written test. The FAA trains new workers on the job and at the FAA Academy. All workers must be certified by FAA examiners before they can work as controllers. Controllers can advance to chief controller and to higher management jobs in air traffic control.

Completion of commercial courses in high school or business school is usually adequate for entry into general clerical occupations such as secretary or typist. However, additional on-the-job training is needed for specialized clerical occupations such as bookkeeper.

Administrative and sales positions are usually filled by college graduates who have majored in business administration, marketing, accounting, industrial relations, or transportation. Some companies have management training programs for college graduates in which trainees work for brief periods in various departments to get a broad picture of air transportation operations before they are assigned to a particular department.

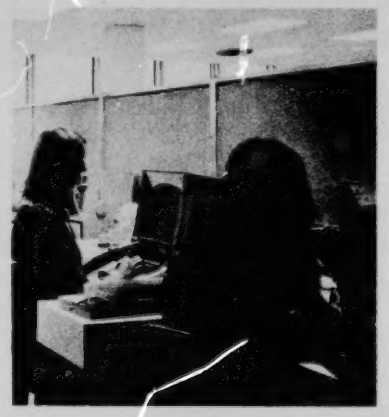
Employment Outlook

The total number of workers in civil aviation occupations is expected to increase about as fast as the average for all occupations through the mid-1980's. Besides the job openings from employment growth, many openings will arise as experienced workers retire, die, or transfer to other fields of work. However, job opportunities may vary from year to year because the demand for air travel fluctuates with ups and downs in the economy.

Airline employment is expected to increase as passenger and cargo traffic grow in response to increases in population, income, and business activity. Employment in other civil aviation activities is expected to rise as more aircraft are purchased for business, agricultural, fire fighting, and recreational purposes.

Employment trends will differ among occupations. The number of reservation, ticket, and passenger

At airport, air traffic controllers keep airplanes that are flying nearby safely separated.



Reservation agents give information about flights and make reservations over the telephone.

agents, for example, is expected to grow rapidly as more people travel by air. On the other hand, the number of air traffic controllers is expected to grow only moderately because new equipment will permit each controller to direct more planes.

Earnings and Working Conditions

Airline employees earned an average of $16,200 a year in 1974, about twice the average for all nonsupervisory workers in private industry, except farming. Among the major occupations, salaries ranged from $700 a month for new reservation agents to $5,800 a month for experienced airline captains. As an additional benefit, airline employees and their immediate families are entitled to a limited amount of reduced-fare transportation with their own and most other airlines.

Airlines operate flights at all hours of the day and night. Personnel in some occupations, therefore, often have irregular hours or work schedules. For example, flight personnel may be away from home bases about one-third of the time or more. When they are away from home, the airlines provide hotel accommodations.

Ground personnel, such as ticket agents and mechanics, usually work a 5-day 40-hour week. Their working hours, however, often include nights, weekends, or holidays. Ground personnel generally receive extra pay for overtime work or an equal amount of time off.

Sources of Additional Information

For information about job opportunities in a particular airline, write to the personnel manager of the company. Addresses of companies are available from the Air Transport Association of America, 1709 New York Ave. NW., Washington, D.C. 20006.

For information about FAA-approved schools that offer training for airplane mechanics, pilots, or other technical occupations in aviation, write to the Research and Inquiry Division, Office of Information Service AIS-230, Federal Aviation Administration, Washington, D.C. 20591.

OCCUPATIONS IN THE ELECTRIC POWER INDUSTRY

Electricity has become so much a part of our daily lives that most people take it for granted. But just imagine not being able to ride the elevator to your apartment and instead having to walk up all those flights of stairs' Or think about having no lights, television set, or radio in your home' Today, it would be difficult to get used to living without electricity.

Bringing electricity into our homes and places of work and recreation is not as simple as just turning on a switch. Tnere are thousands of employees working in the electric power industry to make all this possible.

Nature and Location of the Industry

The delivery of electricity to users at the instant they need it is the unique feature of the electric power systems. Electricity cannot be stored efficiently but must be used as it is produced. Because a customer can begin or increase the use of electric power at any time by merely flicking a switch, an electric utility system must have sufficient capacity to meet peak consumer needs at any time.

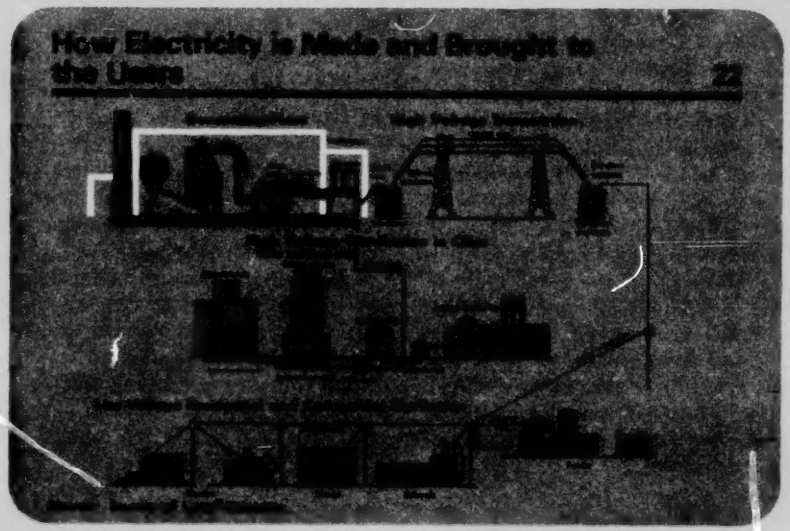
An electric utility system includes powerplants that generate electric power, substations that increase or decrease the voltage, and vast networks of transmission and distribution lines. Electric utilities range from large systems serving broad regional areas to small power companies serving individual communities. Most electric utilities are investor-owned (private) or owned by cooperatives; others are owned by cities, counties, and public utility districts, as well as by the Federal Government. While some utilities generate, transmit, and distribute only electricity, others distribute both electricity and gas. This chapter is concerned with employment relating only to the production and distribution of electric power.

Producing and distributing large quantities of electrical energy involves many processes and activities. The accompanying chart shows how electric energy is generated, and how it travels from the generating station to the users.

The first step in providing electrical energy occurs in a generating station or plant, where huge generators convert mechanical energy into electricity. Electricity is produced primarily in steam-powered generating plants which use coal, gas, oil, or nuclear energy for fuel. In addition, a considerable amount of electricity is produced in hydroelectric generating stations which use water power to operate the turbines. Still other generators, primarily for use in standby service or to provide electricity for special purposes, are powered by diesel engines or gas turbines.

After electricity is generated, it passes through a "switchyard," where the voltage is increased so that the electricity may travel long distances without excessive loss of power. The electricity passes onto transmission lines that carry it from the generating plant to substations, where the voltage is decreased and passed on to the distribution networks serving individual customers. Transmission lines tie together the generating stations of a single system and also the power facilities of several systems. In this way, power can be interchanged among several utility systems to meet varying demands.

In 1974, 550,000 people worked in the electric power industry. Most of them, 465,000, worked in investor-owned utilities and cooperatives and 80,000 worked in Federal



and municipal government utilities. A few large manufacturing establishments, which produce electric power for their own use, also employ electric power workers.

Since electricity reaches almost every locality, jobs in this industry are found throughout the country. Although hydroelectric power projects have created jobs in relatively isolated areas, most utility jobs are still found in heavily populated urban areas.

Electric Utility Occupations. Many different types of workers are required in the electric power industry. About 40 percent of the industry's employees work in occupations related to the generation, transmission, and distribution of electricity, and in customer service occupations. (These occupations are discussed in detail later in this chapter.) The industry also employs large numbers of workers in engineering, scientific, administrative, sales, clerical, and maintenance occupations. A brief discussion on these occupations is given below. Further information can be found in statements covering individual occupations elsewhere in the *Handbook*.

Engineering and Scientific Occupations. Engineers plan generating plant construction and additions, interconnections of complex power systems, and installations of new transmission and distribution systems and equipment. They supervise construction, develop improved operating methods, and test the efficiency of the many types of electrical equipment. In planning modern power systems, engineers help select plantsites, types of fuel, and types of plants. Engineers also help industrial and commercial customers make the best use of electric power.

Administrative and Clerical Occupations. Because of the enormous amount of recordkeeping required, electric utilities employ many administrative and clerical personnel. Large numbers of stenographers, typists, bookkeepers, office machine operators, file clerks, accounting and auditing clerks, and cashiers are employed. These workers keep records of the services rendered by the company, make up bills for customers, and prepare a variety of statements and statistical reports. An increasing amount of this work in the larger offices now is being performed by computers. This generally results in more clerical work being done either by fewer or by the same number of employees. The use of this equipment also creates a need for programmers and computer operators. Administrative employees include accountants, personnel officers, purchasing agents, and lawyers.

Maintenance Occupations. A considerable number of workers test, maintain, and repair equipment. The duties of these skilled craft workers are similar to those of maintenance workers in other industries. Among the more important skilled workers are electricians, instrument repairers, maintenance mechanics, machinists, pipefitters, welders, dispatchers, and boilermakers.

Employment Outlook

Employment in the electric power industry is expected to increase about as fast as the average for all industries through the mid-1980's. The greater use of electric power in industrial processes, growth of commercial centers, and population growth will all contribute to an increased demand for electricity. However, due to the growing use of automatic controls, employment will not increase as fast as electric power production.

Trends in growth will differ from one occupation to another in the industry. The need for scientific, engineering, and technical employees is expected to increase sharply as construction of power generating plants increases and as research into developing more efficient energy usage to combat shortages and higher prices of fossil fuels becomes necessary. Much of this increase in employment will be in the development and construction of new nuclear power facilities.

In many other occupations in this industry, only slight increases in employment are expected. Larger, more efficient powerplants will limit growth of employment of powerplant employees. The increased use of electronic data processing equipment for billing and recordkeeping will restrict growth in some clerical jobs. In occupations which will experience little or no growth, most job openings will result from the need to replace workers who die, retire, or leave the electric power industry for other reasons.

People hired by electric power companies should have relatively secure jobs. Even during downturns in the economy, these companies seldom lay off employees.

Earnings and Working Conditions

Earnings in the electric utility industry are relatively high. In 1974, nonsupervisory employees in private electric power companies averaged $5.55 an hour. By comparison, the average for all nonsupervisory workers in private industry, except farming was $4.22 an hour.

Because supplying electricity is a 24-hour, 7-day-a-week activity, some employees work evenings, nights, and weekends, usually on rotating shifts. Most union contracts with electric utilities provide a higher rate of pay for evening and nightwork than the basic day rate.

Overtime work is often required,

especially during emergencies such as floods, hurricanes, or storms. During an "emergency callout," which is a short-notice request to report for work during nonscheduled hours, the worker generally is guaranteed a minimum of 3 or 4 hours' pay at 1-1/2 times the basic hourly rate. Travel time to and from the job is counted as worktime.

In addition to these provisions which affect pay, electric utilities provide other employee benefits. Generally, annual vacations are granted to workers according to length of service. A typical contract or employee benefit program provides for a 1-week vacation for 6 months to 1 year of service, 2 weeks for 1 to 10 years, and 3 weeks for 10 to 20 years. Some contracts and programs provide for 4 weeks after 18 years, for 5 weeks after 25 years, and 6 weeks after 30 years. The number of paid holidays ranges from 5 to 12 a year. Nearly all companies have benefit plans for their employees. A typical program provides life, hospitalization, and surgical insurance and paid sick leave. Retirement pension plans supplement Federal social security payments and generally are paid for in full or in part by the employer.

Because of the dangers of electrocution and other hazards, electric utilities and unions have made intensive efforts to enforce safe working practices. This has resulted in an injury rate lower than in most manufacturing industries. However, some occupations, especially those on linecrews, are more subject to accidents than others.

Many nonsupervisory electric utility workers in production, transmission, and distribution departments are union members. The bargaining representative for most of these workers is either the International Brotherhood of Electrical Workers or the Utility Workers Union of America. Independent unions represent some utility workers.

Sources of Additional Information

Information about jobs in the electric power industry is available from local electric utility companies, from industry trade associations, or from the local offices of unions that represent electric utility workers. Additional information also may be obtained from:

Edisor Electric Institute, 90 Park Ave., New York, N.Y. 10016.

International Brotherhood of Electrical Workers, 1125 15th St. NW., Washington, D.C. 20005.

Utility Workers' Union of America, 1875 Connecticut Ave. NW., Washington, D.C. 20006.

POWERPLANT OCCUPATIONS

Nature of the Work

Operators are keyworkers in a powerplant. They include four basic classes—boiler, turbine, auxiliary equipment, and switchboard. These operators observe, control, and keep records of the operation of various kinds of powerplant equipment. They make sure that the equipment functions efficiently and detect any trouble that arises. In many new steamplants, including nuclear, these jobs are combined; operators and their assistants are known as steam operators, powerplant operators, or central control room operators.

Of increasing importance are the maintenance personnel, including electrical, instrument, and mechanical repairers. Other powerplant workers include helpers and cleaners, and the custodial staff, including janitors and guards. In steam generating plants using coal for fuel, coal handlers are employed. In hydroelectric plants, gate tenders open and close the headgates that control the flow of water to turbines. Supervision of powerplant operations is handled by chief engineers called operations supervisors, and by their assistants, watch engineers (called shift supervisors).

Boiler operators (D.O.T. 950.782)—employed only where steam generates electricity—regulate the supplies of fuel, air, and water in the boilers and maintain proper steam pressure to turn the turbines. Pressure is measured by gauges, meters, and other instruments mounted on panel boards. One employee may operate one or more boilers.

Turbine operators (D.O.T. 952.138) control the operation of steam or water-powered turbines that drive the generators. In small plants, they also may operate auxiliary equipment or a switchboard. Since modern steam turbines and generators operate at extremely high speeds, pressures, and temperatures, the operator must give close attention to the pressure gauges, thermometers, and other instruments showing the operations of the turbo-generator unit. Turbine operators record the information shown by these instruments and check the oil pressure at bearings, the speed of the turbines, and the circulation and amount of cooling water in the condensers that change the steam back into water. They also are responsible for starting and shutting down the turbines and generators, as directed by the switchboard operator in the control room. Other workers, such as helpers and junior operators, assist the turbine operators.

Auxiliary equipment operators (D.O.T. 952.782) check and record the readings of instruments that indicate the operating condition of pumps, fans, blowers, condensers, evaporators, water conditioners, compressors, and coal pulverizers. Since auxiliary equipment may occasionally break down, these operators must be able to detect trouble quickly, and sometimes make minor repairs. In small plants which do not employ auxiliary equipment

operators, these duties are performed by turbine operators.

Switchboard operators (D.O.T. 952.782) control the amount of electric power flowing from generators to outgoing powerlines by watching instrument panels and by operating switchboards. Switches control the movement of electricity through the generating station circuits and onto the transmission lines. Instruments mounted on panelboards show the power demands on the station at any instant, the powerload on each line leaving the station, the amount of current being produced by each generator, and the voltage.

The operators use switches to distribute the power demands among the generators, to combine the current from two or more generators, and to regulate the flow of the electricity onto various powerlines. When power requirements change, they order generators started or stopped and, at the proper time, connect them to the power circuits in the station or disconnect them. In doing this, they follow telephone orders from the load dispatcher who directs the flow of current throughout the system.

Switchboard operators and their assistants also check their instruments frequently to see that electricity is moving through and out of the powerplant properly, and that correct voltage is being maintained. Among their other duties, they keep records of all switching operations and of load conditions on generators, lines, and transformers. They obtain this information by making regular meter readings.

Control room operator (D.O.T. 950.782). In most powerplants constructed in recent years, the operation of boilers, turbines, auxiliary equipment, and the switching required for balancing generator output has been centralized in a single control room. Here, central control room operators or powerplant operators regulate all the generating equipment, which in older plants requires specialists such as boiler and turbine operators. Control room operators have several assistants who patrol the plant and check the equipment. Operators report to the plant superintendent or a watch engineer when equipment is not operating properly.

Control room worker checks and records instrument readings.

Watch engineers or shift supervisors (D.O.T. 950.131) oversee the employees who operate and maintain boilers, turbines, generators, transformers, and other machinery and equipment. Watch engineers are supervised by a chief engineer or a plant superintendent who is in charge of the entire plant.

Generally, a nuclear-powered plant requires about the same kind and number of employees as a steam-generating plant powered by coal. However, nuclear plants employ a few additional employees such as health and safety specialists.

Training, Other Qualifications, and Advancement

New powerplant workers generally begin at the bottom of the ladder—usually on cleanup jobs. Such work gives beginners an opportunity to become familiar with the equipment and the operations of a powerplant. They advance to the more responsible job of helper, as openings occur. Formal apprenticeships in these jobs are rare. Applicants generally are required to have a high school or vocational school education.

It takes from 1 to 3 years to become qualified as an auxiliary equipment operator and from 4 to 8 years to become a boiler operator, turbine operator, or switchboard operator. A person learning to be an auxiliary equipment operator progresses from helper to junior operator to operator. A boiler operator generally spends from 2 to 6 months as a laborer before being promoted to the job of helper. Depending on openings and the worker's aptitude, the helper may advance to junior boiler operator and eventually to boiler operator, or transfer to the maintenance department and work up to boiler repairer. Turbine operators advance from the ranks of auxiliary equipment operators and are often selected from other plants.

In many States and large cities, employees who operate equipment in powerplants must be licensed by local or State agencies. While licensing requirements often vary from place to place, the National Institute for the Uniform Licensing of Power Engineers (NIULPE) is attempting to standardize these requirements.

Some powerplant workers employed in atomic-powered electric plants must have special training to work with nuclear fuel, in addition to the knowledge and skills required for conventional steam-generated electric power. All control room operators, assistant control room operators, and some operators of high pressure auxiliary equipment in nuclear powerplants must be licensed by the Nuclear Regulatory Commission.

Where a system has a number of generating plants of different size, operators usually first get experience in the smaller stations and

then are promoted to jobs in the larger stations as vacancies occur.

New workers in the switchboard operators section begin as helpers, advance to junior operators, and then to switchboard operators. Some utility companies promote substation operators to switchboard operating jobs. The duties of both classes of operators have much in common. Switchboard operators can advance to work in the load dispatcher's office.

Watch engineers are selected from among experienced powerplant operators. At least 5 to 10 years of experience as a first-class operator are usually required to qualify for a watch engineer's job.

Employment Outlook

Employment of powerplant operators is expected to increase more slowly than the average for all occupations through the mid-1980's, even though the production of electrical energy will increase at a rapid rate. Although some new jobs will become available, most job openings will occur because of the need to replace workers who retire, die, or leave the industry for other work. People hired by electric power companies are likely to have relatively secure jobs. Even during downturns in the economy these companies seldom lay off employees.

Because of the increased demand for electric power, it will be necessary to build and operate many new generating stations. The use of larger and more efficient equipment, however, will result in a great increase in capacity and production without a corresponding increase in the number of powerplant operators. For example, it takes only one turbine operator to control a turbogenerator regardless of the generator's size. Also, automatic equipment makes it possible for one boiler operator to control several boilers from a central control room.

Earnings and Working Conditions

The earnings of powerplant workers vary by occupation and locality. The following tabulation shows estimated average hourly earnings for selected powerplant occupations in privately owned utilities in 1974.

	Average hourly earnings
Auxiliary equipment operator	$4.80
Boiler operator	6.30
Control room operator	7.00
Switchboard operator:	
Switchboard operator, Class A	6.40
Switchboard operator, Class B	5.95
Turbine operator	6.15
Watch engineer	7.35

A powerplant is typically well-lighted and ventilated, clean, and orderly, but there is some noise from the equipment.

Switchboard operators in the control room often sit at the panel boards, but boiler and turbine operators are almost constantly on their feet. The work of powerplant operators generally is not physically strenuous, particularly in the new powerplants. Since generating stations operate 24 hours a day, 7 days a week, some powerplant employees must work nights and weekends, usually on rotating shifts.

Sources of Additional Information

For information concerning licensing of powerplant employees, contact State and local occupational licensing agencies in your area or write to:

National Institute for Uniform Licensing of Power Engineers, 176 W. Adam St., Suite 1914, Chicago, Ill. 60603.

TRANSMISSION AND DISTRIBUTION OCCUPATIONS

Nature of the Work

One-fourth of the workers in the electric power industry are in transmission and distribution jobs. The principal workers in these jobs are those who control the flow of electricity—load dispatchers and substation operators—and employees who construct and maintain powerlines—line installers and repairers, cable splicers, troubleshooters, ground helpers, and laborers. Line installers and repairers make up the largest single occupation in the industry.

Load dispatchers (D.O.T. 950.168), also called system operators or power dispatchers, control the flow of electricity throughout the area served by the utility. The load dispatcher's room is the nerve center of the entire utility system. From this location, the load dispatcher controls the plant equipment used to generate electricity and directs its flow. Dispatchers telephone instructions to the switchboard operators at the generating plants and the substations, telling them when additional boilers and generators are to be started or stopped so that power production will be in balance with power needs.

The load dispatcher must anticipate demands for electric power so that the system will be prepared to meet them. Power demands on utility systems may change from hour to hour. A sudden afternoon rainstorm may cause a million lights to be switched on in a matter of minutes.

Dispatchers also direct the handling of any emergency situation, such as transformer or transmission line failure, and route current around the affected area. They also may be in charge of interconnections with other systems and direct-

ing transfers of current between systems as the need arises.

The load dispatcher's source of information for the entire transmission system is the pilot board. This board, which dominates the load dispatcher's room, is a complete map of the utility's transmission system. It enables the dispatcher to determine, at a glance, the conditions that exist at any point in the system. Lights may show the positions of switches which control generating equipment and transmission circuits, as well as high voltage connections with substations and large industrial customers. The board also may have several recording instruments which make a graphic record of operations for future analysis and study.

Substation operators (D.O.T. 952.782) generally are responsible for the operation of the substation. Under orders from the load dispatcher, they direct the flow of current out of the station by means of a switchboard. Ammeters, voltmeters, and other types of instruments on the switchboard register the amount of electric power flowing through each line. The flow of electricity from the incoming to the outgoing lines is controlled by circuit breakers. The substation operators connect or break the flow of current by manipulating switchboard levers that control the circuit breakers. In some substations, where alternating current is changed to direct current to meet the needs of special users, the operator controls converters which perform the change.

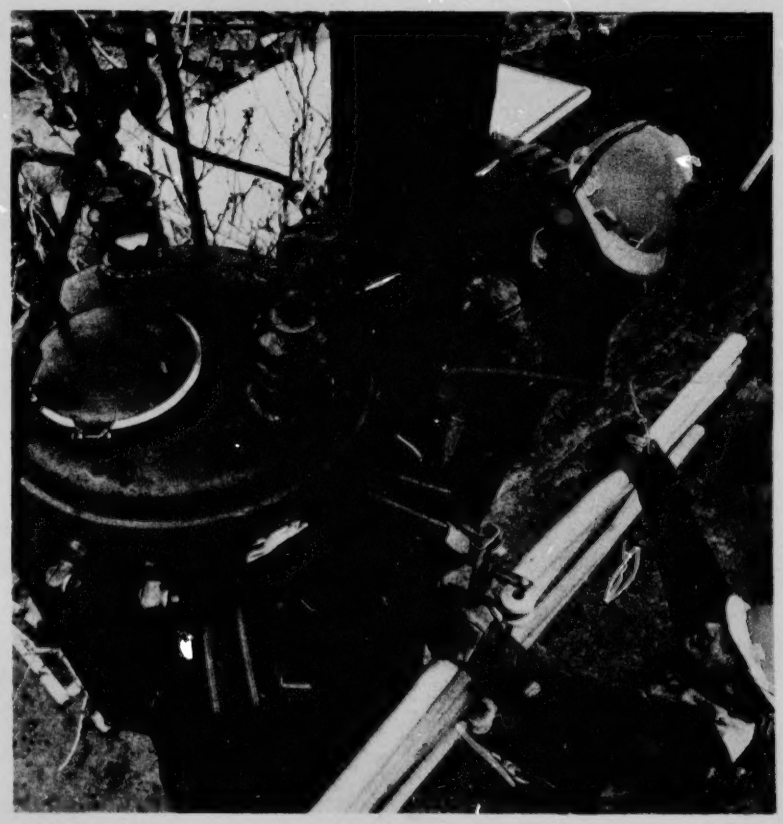
In addition to switching duties, substation operators check the operating condition of all equipment to make sure that it is working properly. They supervise the activities of the other substation employees on the same shift. In smaller substations, the operator may be the only employee.

Some utilities employ a mobile operator who drives from one automatic station to another, inspecting powerlines, operating controls, and assisting customers' electricians in large commercial or government installations. Since this job requires a considerable degree of independent judgment, the mobile operator is usually more experienced than the substation operator.

Line installers and repairers (D.O.T. 821.381) construct and maintain the network of powerlines that carries electricity from generating plants to consumers. Their work consists of installations, equipment replacements, repairs, and routine maintenance. When wires, cables, or poles break, it means an emergency call for a linecrew. Line repairers splice or replace broken wires and cables and replace broken insulators or other damaged equipment. Most installers and repairers now work from "bucket" trucks with pneumatic lifts that take them to the top of the pole at the touch of a lever. In some power companies, linecrew employees specialize in particular types of work. Those in one crew may work on new construction only, and others may do only repair work.

Trouble shooters (D.O.T. 821.281) are experienced line installers and repairers who are assigned to special crews that handle emergency calls. They move from one job to another, as ordered by a central service office which receives reports of line trouble. Often troubleshooters receive their orders by direct radio communications with the central service office.

These workers must have a thorough knowledge of the company's transmission and distribution



Line installers and repairers construct electric powerlines.

network. They first locate and report the source of trouble and then attempt to restore service by making the necessary repairs. Depending on the nature and extent of the problem, troubleshooters may restore service, or simply disconnect and remove the damaged equipment. They must be familiar with all the circuits and switching points so that they can safely disconnect live circuits.

Ground helpers (D.O.T. 821.887) dig poleholes and help line installers and repairers erect the poles or towers which carry the distribution lines. Line installers bolt crossarms to the poles and bolt or clamp insulators in place on the crossarms. Ground helpers then help the installers raise the wires and cables and install them on the poles by attaching them to the insulators. In addition, with assistance from ground helpers, line installers attach a wide variety of equipment to the poles, such as lightning arrestors, transformers, and switches.

Cable splicers (D.O.T. 829.381) install and repair insulated cables on utility poles and towers, as well as those buried underground or those installed in underground conduits. When cables are installed, the cable splicers pull the cable through the conduit and then join the cables at connecting points in the transmission and distribution systems. At each connection in the cable, they wrap insulation around the wiring. They splice the conductors leading away from each junction of the main cable, insulate the splices, and connect the cable sheathing. Most of the physical work in placing new cables or replacing old ones is done by laborers.

Cable splicers spend most of their time repairing and maintaining cables and changing the layout of the cable systems. They must know the arrangement of the wiring systems, where the circuits are connected, and where they lead to and come from. When making repairs, they must make sure that the conductors do not become mixed up between the substation and the customer's premises. Cable splicers also periodically check insulation on cables to make sure it is in good condition.

Training, Other Qualifications, and Advancement

Load dispatchers are selected from experienced switchboard operators and from operators of large substations. Usually, 7 to 10 years of experience as a senior switchboard or substation operator are required for promotion to load dispatcher. To qualify for this job, an applicant must have knowledge of the entire utility system.

Substation operators generally begin as assistant or junior operators. Advancement to the job of operator in a large substation requires from 3 to 7 years of on-the-job training. About 4 years of on-the-job training are needed to qualify as a skilled line installer and repairer. Some companies have formal apprenticeship programs for line employees. Apprenticeship programs combine on-the-job training with classroom instruction in blueprint reading, elementary electrical theory, electrical codes, and methods of transmitting electrical energy.

Apprentices usually begin training by helping ground helpers set poles in place and by passing tools and equipment up to line installers and repairers. After about 6 months, apprentices begin to do simple linework under close supervision, and progress to more difficult work as they gain experience. The training of line installers and repairers who learn their skills on the job generally is similar to the apprenticeship program; it usually takes about the same length of time, but does not involve classroom instruction. A line installer and repairer may advance to troubleshooter after several years of experience.

Candidates for linework should be strong and in good physical condition since work involving climbing poles and lifting lines and equipment is strenuous. They also must have steady nerves and good balance to work at the top of the poles and to avoid the hazards of live wires and falls.

Most cable splicers get their training on the job, usually taking about 4 years to become fully qualified. Workers begin as helpers and then are promoted to assistant or junior splicers. In these jobs, they are assigned more difficult tasks as their knowledge of the work increases.

Employment Outlook

Several thousand job opportunities are expected to be available in transmission and distribution occupations through the mid-1980's. Most of these opportunities will occur because of the need to replace experienced workers who retire, die, or transfer to other fields of work. Workers hired by electric power companies are likely to have relatively secure jobs. Even during downturns in the economy, these companies seldom lay off employees.

Some increase in the employment of transmission and distribution workers is expected, although employment trends will differ among the various occupations in this category. In spite of the need to construct and maintain a rapidly growing number of transmission and distribution lines, the number of line installers and repairers and troubleshooters is expected to increase only slightly because of the use of more mechanized equipment. A limited increase in the number of cable splicers is expected because of the growing use of underground lines in suburban areas. The need for regular substation operators, however, will be reduced substantially, since the introduction of improved and more

automatic equipment makes it possible to operate more substations by remote control. At the same time, more mobile substation operators will probably be required.

Earnings and Working Conditions

Wages for transmission and distribution workers vary by occupation and geographic location. The following tabulation shows estimated average hourly earnings for major transmission and distribution occupations in privately owned utilities in 1974.

	Average hourly earnings
Ground helper	$4.55
Line installer and repairer	6.75
Load dispatcher	7.10
Substation operator	6.05
Trouble shooter	7.75

Load dispatchers and substation operators generally work indoors in pleasant surroundings. Line installers and repairers, troubleshooters, and ground helpers work outdoors. In emergencies, they may work in all kinds of weather. Cable splicers do most of their work in manholes beneath city streets—often in cramped quarters. Safety standards developed over the years by utility companies, with the cooperation of labor unions, have greatly reduced the hazards of these jobs.

CUSTOMER SERVICE OCCUPATIONS

Nature of the Work

Workers in customer service occupations include people who install, test, and repair meters; meter readers; company agents in rural areas; and appliance repairers.

Electric meter repairers (D.O.T. 729.281) are the most skilled workers in this group. They install, test, maintain, and repair meters on customers' premises. Some repairers can handle all types of meters, including the more complicated ones used in industrial plants and other places where large quantities of electric power are used. Others specialize in repairing the simpler kinds, like those in homes. Often, some of the large systems require specialists, such as *meter installers* (D.O.T. 821.381) and *meter testers* (D.O.T. 729.281). Installers put in and take out meters. Testers specialize in testing the small meters used in homes and some of the more complicated ones used by commercial and industrial customers.

Meter readers (D.O.T. 239.588) go to customers' premises to check meters which register the amount of electric energy used. They record the amount of electricity used in a specific period so that each customer can be charged for the correct amount. They also watch for, and report, any tampering with meters.

District representatives usually serve as company agents in outlying districts which are too small to justify more specialized workers. They collect overdue bills; make minor repairs; and read, connect, and disconnect meters. They receive and send service complaints and reports of line trouble to a central office.

Appliance repairers are discussed in a separate chapter elsewhere in the *Handbook*.

Meter readers go to customer's homes to record electricity used.

Training, Other Qualifications, and Advancement

Meter repairers begin their jobs as helpers in the meter testing and repair departments. Persons entering this field should have a basic knowledge of electricity. About 4 years of on-the-job training are required to become a fully qualified meter repairer. Some companies have formal apprenticeship programs in which the trainee progresses according to a specific plan.

Inexperienced workers can qualify as meter readers after a few weeks of training. Beginners accompany the experienced meter reader on the rounds until they have learned the job.

The duties of district representatives are learned on the job. An important qualification for this occupation is the ability to deal tactfully with the public in handling service complaints and collecting overdue bills.

Employment Outlook

Employment in customer service occupations is expected to show little change through the mid-1980's. The need for meter readers will be limited because of the trend toward less frequent readings. Moreover, automatic meter reading may become more common, and new meters will require less maintenance. However, some job openings for meter repairers and

meter readers will occur each year to replace workers who retire, die, or transfer to other fields of work. People hired by electric power companies are likely to have relatively secure jobs. Even during downturns in the economy, these companies seldom lay off employees.

Earnings and Working Conditions

The earnings of customer service workers vary according to the type of job they have and the section of the country in which they work. The following tabulation shows estimated average hourly earnings for major customer service jobs in privately owned utilities in 1974.

	Average hourly earnings
District representative	$6.90
Meter repairer A	6.15
Meter repairer B	5.45
Meter reader	4.90

OCCUPATIONS IN THE MERCHANT MARINE INDUSTRY

In 1974, the merchant marine industry employed about 50,000 people in a variety of occupations that require different levels of skill and education. Many of these jobs are found only in the merchant marine industry.

Nature and Location of the Industry

The merchant marine consists mainly of private firms that carry foreign and domestic commerce aboard oceangoing vessels. In late 1974, nearly all of the 578 ships in the active fleet were privately owned. The small number of government-owned ships in the merchant marine are operated by the Navy's Military Sealift Command (MSC) and have civilian seafaring personnel.

Nearly three-fifths of the ships in our merchant fleet are freighters. These include general cargo ships and special vessels, such as roll-on-roll-off container ships. About two-fifths of the ships are tankers that carry liquid products, such as oil, mostly between the Nation's Gulf and Atlantic Coast ports. Several ships are combination passenger-cargo carriers.

Many ships operate on a regular schedule to specific ports. Others sail for any port promising cargo. The size of a crew depends on the type of vessel. Cargo ships and tankers have crews varying from 26 to 65 persons; passenger ships may have crews of 300 or more.

Most shoreside employees in the industry work in the country's major port cities, and most officers and sailors have home bases in these cities. The Nation's largest port is New York. Other major Atlantic ports are Boston, Philadelphia, Baltimore, Norfolk, Charleston, Savannah, Tampa, and Jacksonville. Gulf ports that handle large volumes of cargo include New Orleans, Houston, and Galveston. Shipping on the West Coast is concentrated in the areas of San Francisco, Los Angeles, Seattle, and Portland.

Occupations in the Industry

More than half of the merchant marine industry's employees are officers and sailors who make up ship crews. Most of the industry's shoreside employees are dockworkers who load and unload ships. A small number of workers have administrative and clerical jobs.

Ship Crews. The *captain* (D.O.T. 197.168) or master, has complete authority and responsibility for the ship's operation, including discipline, order, and the safety of the crew, passengers, and cargo. Under the supervision of the captain, the work aboard ship is divided among the deck, engine, and steward departments.

Deck officers (D.O.T. 197.133), under orders from the captain, direct the navigation of the ship and the maintenance of the deck and hull. *Boatswains* (D.O.T. 911.131) supervise deck crews and see that deck officers' orders are carried out. *Able seamen* (D.O.T. 911.887) steer the ship and report sightings to the deck officer. *Ordinary*

Deck officer uses sextant to determine ship's position.

seamen (D.O.T. 911.887), the entry rating in the deck department, do general maintenance work such as chipping rust, painting, and splicing and coiling ropes. *Deck utility hands* (D.O.T. 911. 884) and *ship's carpenters* (D.O.T.860.281) also are employed to maintain the ship's deck and hull.

Marine engineers (D.O.T. 197.136) are responsible for starting, stopping, and controlling the speed of the main engines and the operation of all other machinery aboard ship. They also direct sailors, such as oilers and wipers, in the lubrication and maintenance of engines, pumps, and other equipment. *Oilers* (D.O.T. 911.884) lubricate moving parts of mechanical equipment. *Wipers* (D.O.T. 699.887) keep the engineroom and machinery clean. *Firers-watertenders* (D.O.T. 951.885) regulate fuel gauges and the amount of water in the boilers. The ship's *electrician* (D.O.T. 825.281) repairs and maintains electrical equipment, such as generators and motors.

The *chief steward* (D.O.T. 350.138) supervises the preparation of meals and the upkeep of living quarters aboard ship. The *chief cook* (D.O.T.315.131) and assistant cooks prepare meals. *Utility hands* (D.O.T. 318.887) carry food supplies from the storeroom, prepare vegetables, and wash cooking utensils. *Mess attendants* (D.O.T. 350.878) set tables, serve meals, wash dishes, and care for living quarters.

Most ships employ *radio officers* (D.O.T. 193.282), who keep contact with the shore and other ships and maintain the radio equipment. Some cargo ships and all passenger vessels carry *pursers* (D.O.T. 197.168), who prepare the necessary papers to allow ships to enter or leave port.

Occupations aboard ship are discussed in detail elsewhere in the *Handbook* in the statements on merchant marine officers and merchant marine sailors.

Engineering officer records pressure gage readings in engine room.

Dock Workers. Many workers are needed to load and unload ships. Terminal managers are responsible for hiring dockworkers called *stevedores* (D.O.T. 911.883). Gang bosses supervise crews of stevedores who load and unload ships and move cargo in and out of warehouses. Some operate materials handling equipment, such as lift trucks and cranes. Stevedores also position and fasten hose lines to the ship's tanks when loading or unloading liquid cargo, such as chemicals and oil.

Clerical Occupations. The merchant marine industry employs workers in general clerical jobs, such as payroll clerk, secretary, and typist. Other clerical workers have specialized jobs. *Billing clerks* (D.O.T. 219.388) type invoices that list items shipped and dates of shipment. *Clerks and dispatchers, pilot station*, (D.O.T. 219.368) keep records of ships entering ports. *Manifest clerks* (D.O.T. 911.368) compile and type the ship's manifest (a list of passengers and cargo) for use at customhouses or terminals. *Receipt and report clerks* (D.O.T. 911.383) prepare reports on labor and equipment costs for loading and unloading cargoes.

Administrative and Professional Occupations. The merchant marine industry employs a small number of administrative and other office personnel. Executives plan and administer company policy. The industry also employs accountants, lawyers, and labor relations and personnel workers. Some *marine architects* (D.O.T. 001.081) are

employed to oversee the construction and repair of ships.

Training, Other Qualifications, and Advancement

Inexperienced workers may be hired as stevedores to load and unload cargo. Applicants must be in good physical condition. A high school education is preferred but not required. Under the guidance of experienced workers, stevedores can learn their jobs in a few weeks. As vacancies occur, they can advance to jobs such as lift truck operator and crane operator. Workers who have supervisory ability may become gang bosses.

No educational requirements are established for jobs aboard ship, but a good education is an advantage. Formal training for officers is conducted at the U.S. Merchant Marine Academy, at five State merchant marine academies, and through programs operated by trade unions. Unions also conduct training programs to upgrade the ratings of sailors.

To obtain an officer's license, a candidate must be a U.S. citizen, physically fit, and pass a written examination administered by the U.S. Coast Guard. Sailors also must obtain licenses (merchant mariner's document) from the Coast Guard. Applicants are required to pass a physical examination and present proof that they have a job offer aboard a U.S. merchant vessel.

Persons who are considering a career at sea must be able to live and work with others as a team. Although peace-time service is relaxed, they must adjust to some military-like discipline that is essential because of the nature of shipboard life.

Most general clerical occupations, such as secretary or bookkeeper, usually require the completion of basic commercial courses in high school or business school. Additional on-the-job training is necessary for specialized clerical occupations, such as manifest clerk and receipt and report clerk.

Administrative positions usually are filled by college graduates who have degrees in business administration, marketing, accounting, industrial relations, or other specialized fields. A knowledge of the merchant marine industry is helpful. Marine architects must be licensed professionals. Requirements for licensing are set by the individual States and generally include graduation from an accredited professional school followed by 3 years of practical experience in an architect's office.

Employment Outlook

Employment in the merchant marine industry is expected to decline through the mid-1980's. Nevertheless, some openings will arise each year from the need to replace experienced workers who retire, die, or transfer to other fields.

Because of substantially higher shipbuilding and labor costs, our merchant fleet finds it difficult to compete in the world shipping market. To insure that our country has a merchant fleet operating in regular or essential trade routes, the Government subsidizes many ships. In 1970, the Government also passed a law which would subsidize the construction of 30 new ships annually over a 10-year period and to improve tax incentives for firms to buy new ships. Despite this support, the size of our merchant fleet probably will not grow significantly, since the number of ships to be built is expected to only slightly exceed the number of older vessels taken out of service.

Little or no change in the employment of ship's officers is expected over the long run. Employment of sailors, on the other hand, is expected to decline because new ships are equipped with laborsaving innovations, such as automated enginerooms, which reduce the need for these workers.

Employment trends also will vary among shoreside occupations. The greater use of containerized cargo ships and improvements in materials handling equipment will reduce the need for stevedores. Employment in administrative and clerical occupations, on the othe hand, is not expected to change significantly.

Earnings and Working Conditions

Stevedores working along the Atlantic and Gulf Coasts earned $6.80 an hour in 1974, and those on the Pacific Coast earned $6.50 an hour. Stevedores also earn extra pay for handling hazardous cargo.

Earnings aboard ships are relatively high; most officers earned a base pay of about $1,350 a month in 1974. Sailors who have advanced a rung or two in rating could receive a base pay of nearly $700 a month. In addition, both officers' and sailors' earnings are supplemented by premium pay for overtime or for assuming extra responsibilities. On the average, additional payments for assuming extra work or responsibility add about 50 percent to base pay. Shipboard workers also receive free meals and lodging while at sea.

Since ship's crewmembers and stevedores are subject to occasional layoff, however, their annual earnings usually are not as high as the hourly rates and monthly salaries would imply.

Most shoreside workers in the industry work a 5-day, 40-hour week. The workweek for people aboard ships is considerably different. Most officers and sailors are required to stand watch, working split shifts around the clock. Generally, they work two 4-hour shifts during every 24-hour period and have 8 hours off between each shift. Other officers and sailors are on duty 8 hours a day, Monday through Friday.

The merchant marine industry provides excellent fringe benefits. Most employers provide paid vacations and holidays. Vacations for sailors and officers range from 90 to 180 days a year. Many firms also provide other benefits such as life, health, and accident insurance. Officers and sailors may retire on full pension after 20 years of service, regardless of age. Stevedores are eligible for pension at age 65.

Working and living conditions aboard ship have improved over the years. Mechanization has reduced the physical demands, and newer vessels have private rooms, air-conditioning, television, and better recreational facilities. However, life aboard ship is confining, and since voyages last several weeks or months, officers and sailors are away from their homes and families much of the time. Some tire of the lengthy separations and choose shoreside employment. However, for many people, the spirit and adventure of the sea, good wages, and fringe benefits more than compensate for the disadvantages.

The duties aboard ship are hazardous compared with other industries. At sea, there is always the possibility of injury from falls or the danger of fire, collision, or sinking. Most shoreside jobs are not hazardous, but stevedores may do heavy lifting and risk injury from falling boxes and other freight when loading and unloading ships.

Most employees are union members. All stevedores are represented by either the International Longshoremen's Association or the International Longshoremen's and Warehousemen's Union. Most officers aboard ships are represented by the International Organization of Masters, Mates and Pilots; and the National Marine Engineers Beneficial Association. Sailors are members of the National Maritime Union of America and the Seafarers' Union.

Sources of Additional Information

For general information about jobs in the merchant marine, write to:

Office of Maritime Manpower, Maritime Administration, U.S. Department of Commerce, Washington, D.C. 20235.

Information about job openings and wages aboard ships can be obtained from local maritime unions. If such a union is not listed in the local telephone directory, contact:

National Maritime Union of America, 36 Seventh Ave., New York, N.Y. 10011.

Seafarers' International Union of North America, 675 Fourth Ave., Brooklyn, N.Y. 11232.

National Marine Engineers, Beneficial Association, 17 Battery Pl., New York, N.Y. 10004.

Further information about stevedore jobs is available from:

International Longshoremen's Association (AFL-CIO), 17 Battery Pl., New York, N.Y. 10004.

International Longshoremen's and Warehousemen's Union (AFLCIO), 150 Golden Gate Ave., San Francisco, Calif. 94102.

OCCUPATIONS IN RADIO AND TELEVISION BROADCASTING

The glamor and excitement of radio and television make broadcasting careers attractive to many people. In 1974 about 120,000 full-time and 30,000 part-time workers were employed in broadcasting; slightly more than half were in radio and the rest were in television. In addition, several thousand freelance performers, such as writers, performers, and musicians, work on a contract basis for stations, networks, and other producers. Several thousand other employees work for independent producers in activities closely related to broadcasting, such as the preparation of filmed and taped programs and commercials.

Broadcasting stations offer a variety of interesting jobs in all parts of the country. Opportunities for entry jobs are best at stations in small communities, although the highest paying jobs are in large cities, especially those with national network stations.

Nature and Location of the Industry

In 1974 about 7,000 commercial radio stations and 700 commercial television stations were in operation in the United States.

Most commercial radio broadcasting stations are small, independent businesses. The average station employs about 11 full-time and 4 part-time workers. Television stations are generally larger, and average about 75 full-time and 10 part-time employees.

Commercial radio stations are served by nine nationwide networks and a large number of regional networks. Stations can affiliate with networks by agreeing to broadcast their programs on a regular basis. The seven national radio networks employed approximately 2,500 workers in 1974.

Most television stations depend on 1 of 3 national television networks for programs that would be too expensive for individual stations to originate—for example, sports events, such as baseball games, or newscasts of national and international significance. These networks, in turn, can offer national coverage to sponsors. As many as 200 stations across the country may carry a network television show. In 1974 the three national networks employed about 18,000 workers, or almost 3 of every 10 staff employees in commercial television. Most network programs originate in New York City or Los Angeles.

In addition to commercial broadcasting stations, there were about 700 educational radio stations (mainly FM) and 220 educational television stations in 1974. These stations are operated principally by educational agencies such as State commissions, local boards of education, colleges and universities, and special community public television organizations. Educational stations employed more than

Announcers read prepared news reports on the air.

8,000 full-time and over 3,000 part-time workers in 1974.

There were also about 3,150 cable TV systems (CATV) employing about 9,500 workers in 1974.

Broadcasting Occupations

About half of all employees in the broadcasting industry hold professional and technical jobs, such as staff announcers, news persons, writers, or broadcast technicians. Clerical and sales workers make up an additional one-fourth, and managerial personnel make up about one-seventh. Many of the remaining employees are craft workers, such as electricians and carpenters.

Jobs vary greatly between small and large stations. In small stations, the station manager, who frequently is the owner, may act as sales manager, or perhaps as program director, announcer, and copywriter. Announcers in small stations may do their own writing, operate the studio control board, and do sales work. The engineering staff may consist of only one full-time broadcast technician assisted by workers from the other departments. In large radio and television stations, jobs are more specialized and usually confined to 1 of 4 departments: programming, technical, sales, or administrative. The kinds of jobs found in each of these departments are described in the following paragraphs.

Programming Department. Staff employees produce daily and weekly shows, assign personnel to cover special events, and provide general program services such as sound effects and lighting. In addition to these staff employees, freelance performers, writers, singers, and other entertainers are hired for specific broadcasts, a series of broadcasts, or for special assignments.

The size of a station's programming department depends on the extent to which its broadcasts are live, recorded, or received from a network. In a small station, a few people make commercial announcements, read news and sports summaries, select and play recordings, and introduce network programs. In a large station, on the other hand, the program staff may consist of a large number of people in a wide variety of specialized jobs.

Program directors are responsible for the overall program schedules of large stations. They arrange for a combination of programs that will effectively meet the needs of advertisers and at the same time be attractive and interesting to the audience.

Traffic managers prepare daily schedules of programs and keep records of broadcasting time available for advertising. *Continuity directors* are responsible for the writing and editing of all scripts. They may be assisted by *continuity writers*, who prepare announcers' books ("copy") which contain the script and commercials for each program along with their sequence and length.

Directors plan and supervise individual programs or series of programs. They coordinate the shows, select artists and studio personnel, schedule and conduct rehearsals, and direct on-the-air shows. They may be assisted by *associate directors*, who work out detailed schedules and plans, arrange for distribution of scripts and changes in scripts to the cast, and help direct on-the-air shows. Some stations employ *program assistants* to aid directors and associate directors. Assistants help assemble and coordinate the various parts of the show. They arrange for props, makeup service, artwork, and film slides and assist in timing. They cue the performers, using cue cards prepared from scripts.

Community and public affairs directors are a link between the station and schools, churches, citizen groups, and civic organizations. They supervise, write, and host public affairs programs.

In large stations, directors may work under the supervision of a *producer*, who selects scripts, controls finances, and handles other production problems. Many times these functions are combined in the job of *producer-director*.

Announcers are the largest and best known group of program workers. Announcers introduce programs, guests, and musical selections and deliver most of the live commercial messages. In small stations, they also may operate the control board, sell time, and write commercial and news copy. Broadcast announcers are discussed in detail elsewhere in the *Handbook*.

Music is an important part of radio programming. Both small and large stations use recordings and transcriptions to provide musical programs and background music for other shows. Large stations, which have extensive music libraries, sometimes employ *music librarians* to maintain music files and answer requests for any particular selection of music. The networks have specialized personnel who plan and arrange for musical services. *Musical directors* select, arrange, and direct music for programs following general instructions from program directors. They select musicians for live broadcasts and direct them during rehearsals and broadcasts. Musicians are generally hired on a freelance basis.

News gathering and reporting is a key aspect of radio and television programming. *News directors* plan and supervise all news and special events coverage. *Newscasters* broadcast daily news programs and report special news events on the scene. *Newswriters* select and write copy for newscasters to read on the air. In small stations, the jobs of newscaster and newswriter often are combined.

Stations that originate live television shows must have staff members who take care of staging the programs. *Studio supervisors* plan and supervise the setting up of scenery

and props. *Floor managers* plan and direct the performers' positions and movements on the set according to directors' instructions. The jobs of studio supervisor and floor manager often are combined. *Property handlers* set up props, hold cue cards, and do other unskilled chores. *Makeup artists* prepare personnel for broadcasts by applying cosmetics. *Scenic designers* plan and design settings and backgrounds for programs. They select furniture, draperies, pictures, and other props to help convey the desired visual impressions. *Sound effects technicians* operate special equipment to simulate sounds, such as gunfire or rain.

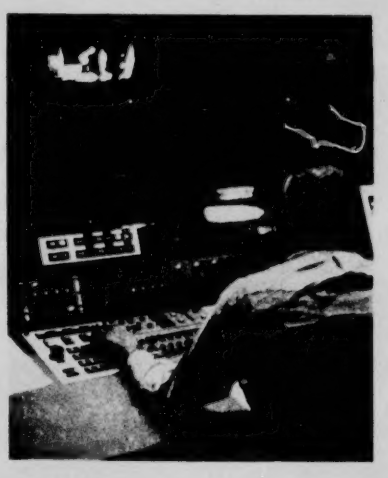
Almost all commercial television programming is recorded either on film or video tape. Broadcast technicians make video tape recordings on electronic equipment that permits instantaneous playback of a performance. Video tape is used to record live shows and to prerecord programs for future broadcasts. Many stations employ specialized staff members to take care of filmed program material. *Film editors* edit and prepare all film for on-the-air presentation. They screen all films received, cut and splice films to insert commercials, and edit locally produced film. *Film librarians* catalogue and maintain files of motion picture film.

Technical Department. Technicians position microphones, adjust levels of sound, keep transmitters operating properly, and move and adjust lights and television cameras to produce clear, well-composed pictures. They also install, maintain, and repair the many types of electrical and electronic equipment required for these operations.

Most stations employ *chief engineers*, who are responsible for all engineering matters, including supervision of technicians. In small stations, they also may work at the control board and repair and maintain equipment. Large stations have engineers who specialize in fields such as sound recording, maintenance, and lighting. Networks employ a few *development engineers* to design and develop new electronic apparatus to meet special problems.

Broadcast technicians have many jobs. For example, they control the operation of the transmitter to keep the level and frequency of broadcast within legal requirements. They also set up, operate, and maintain equipment in the studio and in locations where remote broadcasts are to be made. (Further information on broadcast technicians is given elsewhere in the *Handbook*.)

Sales Department. Sales representatives, the largest group of workers in this department, sell advertising time to sponsors, advertising agencies, and other buyers. They must have a thorough knowledge of the station's operations, programming, and the characteristics of the people in the area it serves. The latter includes population, number of radio and television sets in use, income levels, and consumption patterns. Sales representatives in large stations often work closely with sponsors and advertising agencies. Many stations sell a substantial part of their time, particularly to national advertisers, through independent advertising agencies.



Broadcast technician regulates quality of picture.

Large stations generally have several workers who do only sales work. The sales manager supervises them, and also may handle a few of the largest accounts personally. Some large stations employ statistical clerks and research personnel to help analyze and report market information on the community served.

Business Management. In a very small station, the owner and a secretary may handle all the record-keeping, accounting, purchasing, hiring, and other routine office work. If the size of the station warrants full-time specialists, the business staff may include accountants, publicity specialists, personnel workers, and other professional workers. They are assisted by office workers, such as stenographers, typists, bookkeepers, clerks, and messengers.

Training, Other Qualifications, and Advancement

A high school diploma is the minimum educational requirement for most entry jobs in broadcasting, although for some jobs college training is preferred. A liberal arts education is a good qualification for the beginner because broadcasters need people with knowledge and interests in many areas. Television programming for networks and large independent stations generally requires a college degree and some experience in broadcasting.

Some young people without specialized training or experience get their start in broadcasting in jobs such as clerk, typist, property handler, or assistant to an experienced worker. As these new workers gain knowledge and experience, they have the chance to advance to more

responsible jobs. A few people get started in broadcasting with temporary jobs in the summer when regular workers go on vacation and broadcast schedules of daylight-hours stations are increased.

Technical training in electronics is required for entry jobs in engineering departments. The chief engineer of a television or radio station and any employee who adjusts a broadcast transmitter must have a Federal Communications Commission (FCC) Radiotelephone First Class Operator License. In addition, anyone who operates a radio broadcast transmitter must have at least an FCC Radiotelephone Third Class Operator License. To obtain these licenses, an applicant must pass a series of technical examinations given by the FCC. Small radio stations with only a few employees sometimes prefer to have as many staff members as possible who are legally qualified to operate their transmitters. Because of this, nontechnicians, especially announcers, have a better chance of getting a job in radio if they have a first- or third-class license. A course in electronics at a recognized technical institute is probably the best way to prepare for the FCC test. In addition, high school courses in electronics, mathematics, and physics are often helpful to persons who plan to pursue careers as broadcast technicians.

Entry jobs as announcers in small stations usually do not require specific training or experience, but an applicant must have a good voice, a broad cultural background, and other characteristics that make a dramatic or attractive personality. Courses in speech, English, social science, drama, and electronics are helpful to persons seeking careers as announcers. In addition, college campus radio experience, summer and part-time employment at local stations, and a good knowledge of the commercial industry are all highly regarded as backgrounds. Qualifications for administrative and sales jobs in broadcasting are similar to those required by other employers; a business course program of study in high school or a college degree in business or management is good preparation for such jobs.

Most beginners start out in small stations. Although these stations cannot pay high salaries, they offer opportunities to learn the different phases of broadcasting work because they generally use personnel in combination jobs. For example, an announcer may perform some of the duties of a broadcast technician.

People in the technical department tend to remain in this area of work, where thorough training in electronics is essential. Program employees usually remain in programming work, although sometimes transfers to and from the sales and business departments are made. Transfers are easier between sales and business departments because of their close working relationship; in fact, in the small stations, they are often merged into one department. Although transfers of experienced workers between departments are limited to the extent noted, these distinctions are less important in beginning and top-level jobs. At the higher levels, a station executive may be drawn from top-level personnel of any department.

Many radio and television station managers consider training in a private vocational school to be helpful for people interested in careers in the broadcasting industry. However, before enrolling in any vocational broadcasting school, prospective students should contact employers and broadcasting trade organizations in their area to determine the school's performance in producing suitably trained candidates.

Employment Outlook

Employment in the broadcasting industry is expected to grow faster than the average for all industries through the mid-1980's. Besides the job openings from growth, many openings will result from the need to replace experienced workers who retire, die, or leave the industry for other reasons. Competition will be very keen for entry jobs, especially in the large cities, because of the attraction this field has for young people.

New radio stations are expected to open, particularly in small communities, and will offer opportunities for some additional workers. In existing radio stations, however, technological developments will limit employment growth. For example, automatic programming equipment permits radio stations to provide virtually unattended programming.

The number of educational television stations is expected to increase as private and government groups continue to expand in this area. The growth of educational stations will increase job opportunities, especially in programming, engineering, and station management.

Cable television (CATV) has emerged as a powerful new force in communications, and some additional job opportunities for professional, technical, and maintenance workers will be created as CATV systems increasingly originate and transmit programs. Many of these new jobs will be in small cities where most CATV systems are located to improve television reception in rural areas. By using cables instead of airwaves, CATV can offer customers a larger selection of stations plus many additional programs produced specifically for cable television.

Earnings and Working Conditions

In 1974 earnings of nonsupervisory broadcasting workers averaged $5.02 an hour, nearly one-fifth more than the average for

nonsupervisory workers in private industry, except farming. Salaries range widely among occupations and locations in the broadcasting industry. Employees in large cities generally earn much more than those in the same kinds of jobs in small towns. Wages also tend to be higher in large stations than in small ones, and higher in television than in radio.

Most full-time broadcasting employees have a scheduled 40-hour workweek; employees in many small stations work longer hours. Sales and business employees generally work in the daytime hours common to most office jobs. However, program and engineering employees must work shifts which may include evenings, nights, weekends, and holidays. To meet a broadcast deadline, program and technical employees in the networks may have to work continuously for many hours under great pressure.

Several unions operate in the broadcasting field. They are most active in the network centers and large stations in metropolitan areas. The National Association of Broadcast Employees and Technicians and the International Brotherhood of Electrical Workers both organize all kinds of broadcasting workers, although most of their members are technicians. The International Alliance of Theatrical Stage Employees and Moving Picture Machine Operators organizes various crafts, such as stagehands, sound and lighting technicians, wardrobe attendants, makeup artists, and camera operators. Many announcers and entertainers are members of the American Federation of Television and Radio Artists. The Directors Guild of America, Inc. (Ind.) organizes program directors, associate directors, and stage managers. The Screen Actors Guild, Inc., represents the majority of entertainers who appear on films made for television.

Sources of Additional Information

For general information about careers in radio and television broadcasting, write to:

National Association of Broadcasters, 1771 N St. NW., Washington, D.C. 20036.

For information about college courses in television broadcasting, contact:

Executive Secretary, Broadcasting Education Association, National Association of Broadcasting, 1771 N St. NW., Washington, D.C. 20036.

For general information about careers in public radio and television broadcasting, write to:

Corporation for Public Broadcasting, 888 16th St. NW., Washington, D.C. 20006.

OCCUPATIONS IN THE RAILROAD INDUSTRY

The railroads, with their network of more than 200,000 miles of line reach into all parts of the country. In 1974, they carried over one and a half billion tons of freight and 274 million passengers.

Trains are one of the most efficient methods of transporting large amounts of freight over distances exceeding several hundred miles. Locomotives can pull thousands of tons of cargo using fewer employees and far less fuel than trucks and airplanes.

With 560,000 workers in 1974, the railroads were one of the Nation's largest employers. Railroad workers operate trains, build and repair equipment and facilities, provide services to customers, and collect and account for revenue. In most of these jobs, seniority systems prevail with workers starting at the bottom and working their way up.

Nature and Location of the Industry

The railroad industry is made up of "line-haul" railroad companies that transport freight and passengers, and switching and terminal companies that provide line-haul railroads with services at some large stations and yards.

About 95 percent of all railroad employees work for line-haul companies that handle about 99 percent of the industry's business. The remainder work for switching and terminal companies. Most railroad revenue and employment comes from freight. Passenger service has declined substantially in the past 30 years.

Railroad workers are employed in every State except Hawaii. Large numbers work at terminal points where the railroads have central offices, yards, and maintenance and repair shops. Chicago, the hub of the Nation's railroad network, has more railroad employees than any other area. Many employees also work at the major railroad operations centered near New York, Los Angeles, Philadelphia, Minneapolis, Pittsburgh, and Detroit.

Railroad Occupations

Railroad workers can be divided into four main groups: Operating employees; station and office workers; equipment maintenance workers; and property maintenance workers.

Operating employees make up almost one-third of all railroad workers. This group includes locomotive engineers, conductors, and brake operators. Whether on the road or at terminals and railroad yards, they work together as traincrews. Also included are switchtenders who help conductors and brake operators by throwing track switches in railroad yards and hostlers who fuel, check, and deliver locomotives from the engine house to the crew.

One-fourth of all railroad workers are station and office employees who direct train movements and handle the railroads' business affairs. Professionals such as managers, accountants, statisticians, and systems analysts do administrative and planning work, while clerks keep records, prepare statistics, and handle business transactions such as collecting bills and adjusting claims. Agents manage the business affairs of the railroad station. Telegraphers and telephoners pass on instructions to traincrews and help agents with clerical work.

More than one-fifth of all railroad employees are *equipment maintenance workers*, who service and repair locomotives and cars. This group includes car repairers, machinists, electrical workers, sheet-metal workers, boilermakers, and blacksmiths.

Property maintenance workers, who make up about one-sixth of all railroad employees, build and repair tracks, tunnels, signals, and other railroad property. Track workers repair tracks and roadbeds. Bridge and building workers construct and repair bridges, tunnels, and other structures along the right-of-way. Signal workers install and service the railroads' vast network of signals, including highway crossing protection devices.

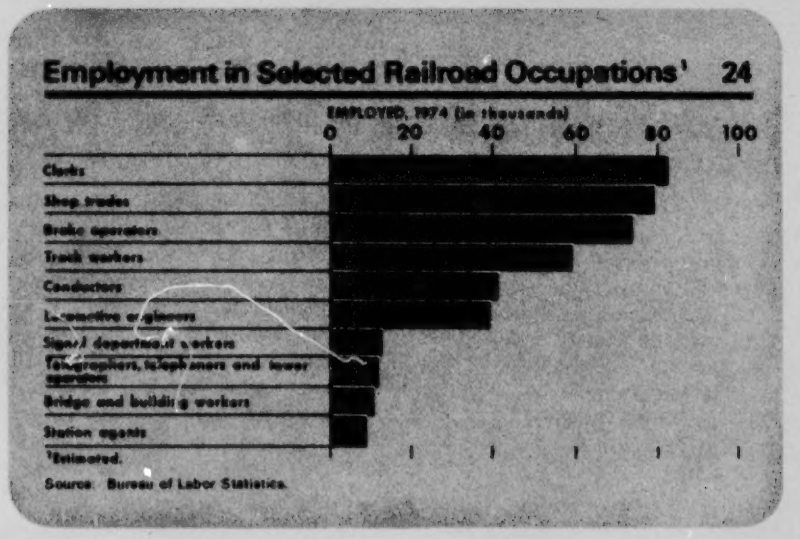
The accompanying chart shows the number of workers in major railroad occupations in 1974. Detailed information about some of these occupations is given elsewhere in the *Handbook*.

Training, Other Qualifications, and Advancement

Most beginning railroad workers are trained on the job by experienced employees. Training for some office and maintenance jobs is available in high schools and vocational schools. Universities and technical schools offer courses in accounting, engineering, traffic management, transportation, and other subjects which are valuable to professional and technical workers.

New employees in some occupations, especially those in operating service jobs such as locomotive engineer, start as "extra board" workers. They substitute for regular workers who are on vacation, ill, or absent for other reasons. They also may be called when railroad traffic increases temporarily or seasonally.

Extra board workers with enough



seniority move to regular assignments as they become available. The length of time on the extra board varies according to the number of available openings. Some workers do not receive regular assignments for many years.

Beginners in shop trades usually are high school graduates with no previous experience, although some shop laborers and helpers are promoted to the trades. Shopworkers serve apprenticeships that last 3 to 4 years, depending on how much previous work experience the apprentice has.

Most applicants for railroad jobs must pass physical examinations. Those interested in traincrew jobs need excellent hearing and eyesight. Color-blind persons are not hired as locomotive engineers or brake operators or for any other jobs that involve interpreting railroad signals.

Railroad workers are promoted on the basis of seniority and ability. Job openings are posted on bulletin boards and workers may bid for them. The worker highest on the seniority list usually gets the job. To be promoted, however, workers may have to qualify by passing written, oral, and practical tests. Advancement in train and engine jobs is along established lines. All conductors, for example, are chosen from qualified brake operators.

Besides determining advancement procedures, seniority also gives workers some choice of working conditions. A telegrapher, for instance, may have to work several years on the night shift at out-of-the-way locations before finally getting a day shift assignment near home.

Employment Outlook

The longrun decline in railroad employment is expected to continue through the mid-1980's, but at a decreasing rate. Nevertheless, thousands of job opportunities will develop each year as the industry replaces some experienced workers who retire, die, or transfer to other fields of work.

Despite an expected increase in freight traffic, railroad employment will decline, mainly as a result of increased worker productivity due to technological innovations. For example, as automatic classification systems are installed in more yards, fewer yard workers will be needed to assemble and disassemble trains. The installation of wayside scanners, which identify cars electronically, will reduce the need for clerical workers.

Most people working in passenger service may eventually work for AMTRAK, the National Railroad Passenger Corporation, created in 1971 to revive passenger service trains. However, it will take years to carry out the AMTRAK program, and it is too early to determine its effect on these jobs.

Earnings and Working Conditions

Nonsupervisory railroad employees averaged $5.68 an hour in 1974, about one-third higher than the average for all nonsupervisory workers in private industry, except farming. Earnings of railroad workers vary widely, however, depending on the occupation. For example, in 1974 average hourly earnings for locomotive engineers in passenger service were $10.55; for freight service brake operators $6.73; for railway clerks, $5.61; and for track gang members, $4.95. Regional wage differences are much less in railroading than in other industries because of nationally negotiated labor contracts.

Most railroad employees work a 5-day, 40-hour week, and receive premium pay for overtime. However, operating employees, station agents, and telegraphers and telephoners often work nights, weekends, and holidays. Extra board workers may be called at any time. Bridge and building workers, signal installers, and track workers may work away from home for days at a time.

Sources of Additional Information

Additional information about occupations in the railroad industry may be obtained from local railroad offices. For general information about the industry, write to:

Association of American Railroads, American Railroads Building, 1920 L St. NW., Washington, D.C. 20036.

OCCUPATIONS IN THE TELEPHONE INDUSTRY

About 600 million local and long distance telephone calls are made daily in the United States and overseas. In 1974, approximately 975,000 employees provided this daily service.

The telephone industry offers steady, year-round employment in many different jobs. Some jobs, such as telephone operator and file clerk, can be learned in a few weeks; others, such as installer and repairer, require many months.

Nature and Location of the Industry

Providing telephone service for the many millions of residential, commercial, and industrial customers is the main work of the Nation's telephone companies. More than 144 million telephones were in use in the United States in 1974.

Telephone jobs are found in almost every community. Most telephone workers, however, work in cities having large concentrations of industrial and business establishments. The nerve center of the local telephone system is the central office that has the switching equipment through which a telephone may be connected with any other telephone. Every call travels from the caller through wires and cables to the cable vault in the central office. Thousands of pairs of wires fan out from the cable vault to a distributing frame where each set of wires is attached to switching equipment. Electromechanical and electronic switching equipment make connections automatically. In a few remaining switchboards and in unusual situations an operator makes the connection.

Some customers make and receive more calls than a single telephone line can handle. For this larger volume of calls, a system somewhat similar to a miniature central office may be installed on the customer's premises. This system is the private branch exchange (PBX), usually found in office buildings, hotels, department stores, and other business firms.

A newer type of service is called CENTREX, in which incoming calls can be dialed to any extension without an operator's assistance, and outgoing and intercom calls can be dialed by the extension users. This equipment can be located either on telephone company premises or on the customer's premises. CENTREX is currently replacing PBX in popularity among business and industrial users which handle a very large volume of calls. However, PBX is still more popular with smaller users.

Other communications services provided by telephone companies include conference equipment installed at a PBX to permit conversations among several telephone users simultaneously; mobile radiotelephones in automobiles, boats, airplanes and trains; and telephones equipped to answer calls automatically and to give and take messages by recordings.

Telephone companies also build and maintain most of the vast network of cables and radio-relay systems for communications services, including those joining the thousands of broadcasting stations all over the Nation. These services are leased to networks and their affiliated stations. Telephone companies also lease data and private wire services to business and government offices.

The Bell System owns about 4 out of 5 of the Nation's domestic telephones. Independent telephone companies own the remainder. There are approximately 1,655 independent telephone companies in the United States. General Telephone and Electronics Corp. in Stamford, Conn., United Utilities, Inc. in Kansas City, and Continental Telephone Corp. in Chantilly, Va. service about 2 out of every 3 telephones owned by independent companies.

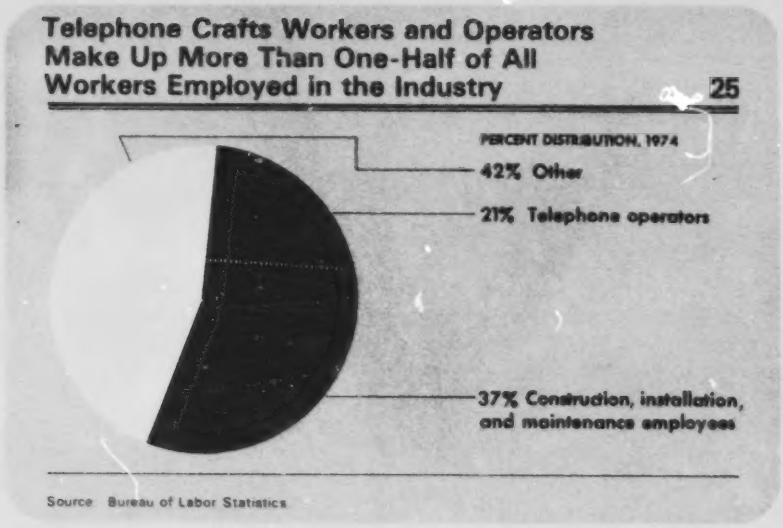
Telephone Occupations

Although the telephone industry requires workers in many different occupations, telephone craft workers and operators make up more than one-half of all workers. (See accompanying chart.)

Telephone craft workers install, repair, and maintain telephones, cables, switching equipment, and message accounting systems. These workers can be grouped by the type of work they perform: construction workers place, splice, and maintain telephone wires and cables; installers and repairers place, maintain, and repair telephones and private branch exchanges (PBX) in homes and offices and other places of business; and central office craft workers test, maintain, and repair equipment in central offices.

Operators make telephone connections; assist customers in specialized services, such as reverse-charge calls; and give telphone information. Detailed discussions of telephone craft occupations and telephone and PBX operators are presented elsewhere in the *Handbook*.

More than one-fifth of all telephone industry employees are clerical workers. They include stenographers, typists, book-


Telephone Crafts Workers and Operators Make Up More Than One-Half of All Workers Employed in the Industry
25
PERCENT DISTRIBUTION, 1974
42% Other
21% Telephone operators
37% Construction, installation, and maintenance employees
Source: Bureau of Labor Statistics

keepers, office machine and computer operators, keypunch operators, cashiers, receptionists, file clerks, accounting and auditing clerks, and payroll clerks. Clerical workers keep records of services, make up and send bills to customers, and prepare statistical and other reports.

About one-tenth of the industry's employees are professional workers. Many of these are scientific and technical personnel such as engineers and drafters. Engineers plan cable and microwave routes, central office and PBX equipment installations, new buildings, the expansion of existing structures, and solve other engineering problems.

Some engineers also engage in research and development of new equipment. Many top managers and administrators have engineering backgrounds. Other professional and technical workers are accountants, personnel and labor relations workers, public relations specialists and publicity writers, computer systems analysts, computer programmers, and lawyers.

Nearly one-tenth of the industry's employees are business and sales representatives who sell new communications services, directory advertising, and handle requests for installing or discontinuing telephone service.

About 3 percent of the industry's workers maintain buildings, offices, and warehouses; operate and service motor vehicles; and do other maintenance jobs in offices and plants. Skilled maintenance workers include stationary engineers, carpenters, painters, electricians, and plumbers. Other workers employed by the telphone industry are janitors, porters, and guards.

Employment Outlook

Telephone industry employment is expected to increase about as fast as the average for all industries through the mid-1980's. In addition to the jobs from employment growth, tens of thousands of openings will arise each year because of the need to replace experienced workers who retire, die, or leave their jobs for other reasons.

Employment will grow primarily because rising population and higher incomes will increase the need for telephone service. Greater demand for transmission of computer-processed data and other information via telephone company lines also will stimulate employment growth. Laborsaving innovations, however, will keep employment from growing as rapidly as telephone service.

Employment of telephone operators is expected to decline slightly. If the trend in the number of telephone companies charging customers for directory assistance calls continues, more people will dial numbers direct and use telephone directories to locate needed numbers, thus reducing the need for operators. Technological innovations will restrict employment growth in some skilled crafts. For example, mechanical improvements, such as pole-lifting equipment and earth-boring tools, will limit employment of line installers by increasing their efficiency. On the other hand, new technology is expected to increase the demand for engineering and technical personnel, especially electrical and electronic engineers and technicians, computer programmers, and systems analysts. Employment in administrative and sales occupations will rise as telephone business increases.

Earnings and Working Conditions

In 1974 earnings for nonsupervisory telephone employees averaged $5.08 an hour. In comparison, nonsupervisory workers in all private industries, except farming, averaged $4.22 an hour.

In early 1974, basic rates ranged from an average of $3.40 an hour for telephone operator trainees to $9.56 for professional and semiprofessional workers.

A telephone employee usually starts at the minimum wage for the particular job. Advancement from the starting rate to the maximum rate generally takes 5 years, but operators and clerical employees of some companies may reach the maximum rate in 4 years.

More than two-thirds of the workers in the industry, mainly telephone operators and craft-

workers, are members of labor unions. The two principal unions representing workers in the telephone industry are the Communications Workers of America and the International Brotherhood of Electrical Workers, but many other employees are members of the 13 independent unions which form the Alliance of Independent Telephone Unions.

Union contracts govern wage rates, wage increases, and the amount of time required to advance from one step to the next for most telephone workers. The contracts also call for extra pay for work beyond the normal 6 to 8 hours a day, or 5 days a week, and for all Sunday and holiday work. Most contracts provide a pay differential for night work.

Overtime work sometimes is required, especially during emergencies, such as floods, hurricanes, or bad storms. During an "emergency call-out," which is a short-notice request to report for work during nonscheduled hours, workers are guaranteed a minimum period of pay at the basic hourly rate. Travel time between jobs is counted as worktime for craft workers under some contracts.

Paid vacations are granted according to length of service. Usually, contracts provide for a 1-week vacation beginning with 6 months of service; 2 weeks for 1 to 7 years; 3 weeks for 8 to 15 years; 4 weeks for 16 to 24 years; and 5 weeks for 25 years and over. Depending on locality, holidays range from 9 to 11 days a year. Most telephone workers are covered by paid sick plans and group insurance which usually provide sickness, accident, and death benefits, and retirement and disability pensions.

The telephone industry has one of the best safety records in American industry. The number of disabling injuries has been well below the average.

Sources of Additional Information

More details about employment opportunities are available from the telephone company in your community or local offices of the unions that represent telephone workers. If no local union is listed in the telephone directory write to:

Alliance of Independent Telephone Unions, P.O. Box 5462, Hamden, Conn. 16518.

Communication Workers of America, 1925 K St. NW., Washington, D.C. 20006.

International Brotherhood of Electrical Workers, 1200 15th St. NW., Washington, D.C. 20005.

United States Independent Telephone Association, 1801 K St. NW., Suite 1201, Washington, D.C. 20006.

OCCUPATIONS IN THE TRUCKING INDUSTRY

In 1974, the trucking industry employed approximately 1.2 million workers—more than the rival rail, air, and pipeline transportation industries combined. It is a major employer of persons not planning to attend college, since nearly 90 percent of its employees are freight handlers, drivers, truck maintenance personnel, or clerical workers, who only require a high school education.

Nature and Location of the Industry

The trucking industry is made up of companies that sell transportation and storage services. Although many trucking companies serve only a single city and its suburbs, and others carry goods only between distant cities, most large trucking firms provide both types of service. Moreover, some firms operate one type of truck and specialize in one type of product. For example, they may carry steel rods on flat trailers or grain in open top vans. In addition, trucking companies may operate as either contract or common carriers. Contract carriers haul commodities of one or a few shippers exclusively; common carriers serve the general public.

Drivers "keep on trucking" in all kinds of weather.

The industry's employment is concentrated in a relatively small number of large companies. Almost half of the industry's workers are employed by less than 10 percent of the companies. On the other hand, a large proportion of companies are small, particularly those which serve a single city. Many companies are owner-operated, and the owner does the driving.

Trucking industry employees work in cities and towns of all sizes and are distributed much the same as the Nation's population.

Occupations in the Industry

About three-fourths of all trucking industry employees have blue-collar jobs, including about 600,000 truckdrivers. Other important blue-collar occupations are material handlers, mechanics, washers and lubricators, and supervisors. Most white-collar employees are clerical workers, such as secretaries and rate clerks, and administrative personnel, such as terminal managers and accountants.

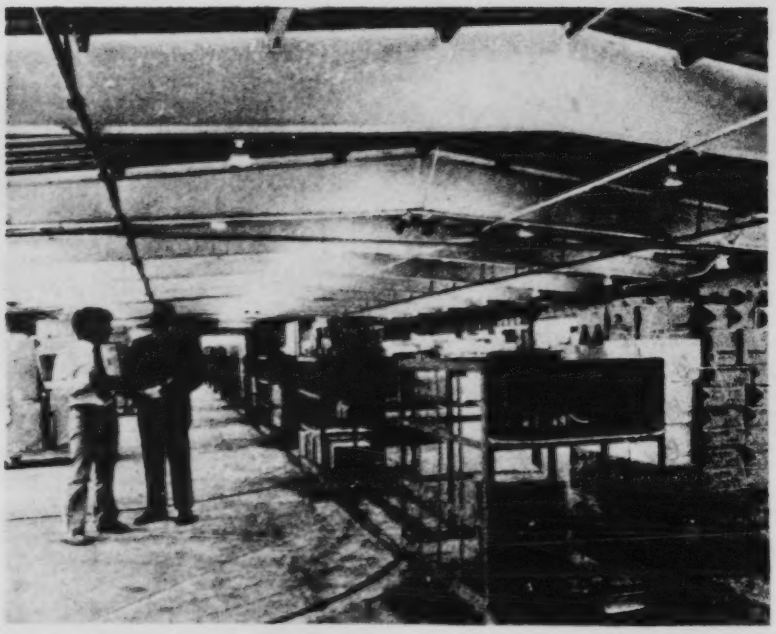
The duties and training requirements of some of the important occupations are described briefly in the following sections.

Truckdriving Occupations. More than half of the industry's employees are drivers. *Long-distance truckdrivers* (D.O.T. 904.883) spend nearly all their working hours driving large trucks or tractor trailers between terminals. Some drivers load and unload their trucks; usually, however, other employees do this work. *Local truckdrivers* (D.O.T. 906.883) operate trucks over short distances, usually within one city and its suburbs. They pick up goods from, and deliver goods to, trucking terminals, businesses, and homes in the area.

Clerical Occupations. About 1 out of every 8 of the industry's employees is a clerical worker. Many have general clerical jobs, such as secretary or clerk-typist, which are common to all industries. Others have specialized jobs. For example, *dispatchers* (D.O.T. 919.168) coordinate the movement of trucks and freight into and out of terminals; make up loads for specific destinations; assign drivers and develop delivery schedules; handle customers' requests for pickup of freight, and provide information on deliveries. *Claims adjusters* (D.O.T. 241.368) handle claims for freight lost or damaged during transit. *Manifest clerks* (D.O.T. 222.488) prepare forms that list details of freight shipments. *Parts-order clerks* (D.O.T. 223.387) supply mechanics with replacement parts for trucks; they also take care of most of the clerical duties needed to maintain a truck repair shop.

Administrative and Related Occupations. More than 1 out of 15 employees is an administrator. Top executives manage companies and make policy decisions. Middle managers supervise the operation of individual departments, terminals, or warehouses. A small number of accountants and lawyers are employed by these companies. The industry also employs sales representatives to solicit freight business.

Material Handling Occupations. About 1 out of 12 employees moves freight into and out of trucks and warehouses. Much of this work is



Assembling loads in advance permits trucks to be loaded quickly.

done by *material handlers* (D.O.T. 929.887) who work in groups of three or four under the direction of a dock supervisor or gang leader. Material handlers load and unload freight with the aid of handtrucks, conveyors, and other devices. Heavy items are moved by *power truck operators* (D.O.T. 922.883) and *crane operators* (D.O.T. 921.280). Gang leaders determine the order in which items will be loaded, so that the cargo is balanced and items to be unloaded first are near the truck's door. *Truckdrivers' helpers* (D.O.T. 905.887) travel with drivers to unload and pick up freight. Occasionally, helpers may do relief driving.

Truck Maintenance Occupations. About 1 out of every 20 employees takes care of the trucks. *Truck mechanics* (D.O.T. 620.281) keep trucks and trailers in good running condition. Much time is spent in preventive maintenance to assure safe operation, to check wear and damage to parts, and to reduce breakdowns. When breakdowns do occur, these workers determine the cause and make the necessary repairs. *Truck mechanic helpers* (D.O.T. 620.884) and apprentices assist experienced mechanics in inspection and repair work. *Truck lubricators* and *washers* (D.O.T. 915.887 and 919.887) clean, lubricate, and refuel trucks, change tires, and do other routine maintenance.

Training, Other Qualifications, and Advancement

Workers in blue-collar occupations usually are hired at the unskilled level, as material handlers, truckdrivers' helpers, lubricators, and washers. No formal training is required for these jobs, but many employers prefer high school school graduates. Applicants must be in good physical condition. New employees work under the guidance of experienced workers and supervisors while learning their jobs; this usually takes no more than a few weeks. As vacancies occur, workers advance to more skilled blue-collar jobs, such as power truck operator and truckdriver. The ability to do the job and length of service with the firm are the primary qualifications for promotion. Material handlers who demonstrate supervisory ability can become gang leaders or dock supervisors.

Qualifications for truckdriving jobs vary and depend on individual employers, the type of truck, and other factors. In most States, drivers must have a chauffeur's license, a commercial driving permit obtained from State motor vehicle departments. The U.S. Department of Transportation establishes minimum qualifications for long-distance drivers. They must be at least 21 years old, be able-bodied, have good hearing, and have at least 20/40 vision with or without glasses. However, many firms will not hire drivers under 25 years of age. Drivers also must be able to read, speak, and write English well enough to complete required reports. Drivers must have good driving records.

People interested in professional driving should take the driver-training courses offered by many high schools. A course in automotive mechanics also is helpful. Private truckdriving training schools offer another opportunity to prepare for a driving job. However, completion of such a course does not assure employment as a driver.

Most truck mechanics learn their skills informally on the job as helpers to experienced mechanics. Others complete formal apprenticeship programs which generally last 4 years and include on-the-job training and related classroom instruction. Unskilled workers, such as lubricators and washers, frequently are promoted to jobs as helpers and apprentices. However, many firms will hire inexperienced people, especially those who have completed courses in automotive mechanics, for helper or apprentice jobs.

Lubricators help keep the trucks in good operating condition.

Completion of commercial courses in high school or in a private business school is usually adequate for entry into general clerical occupations such as secretary or typist. Additional on-the-job training is needed for specialized clerical occupations such as claims adjuster.

Generally, no specialized education is needed for dispatcher jobs. Openings are filled by truckdrivers, claims adjusters, or other workers who know their company's operations and are familiar with State and Federal driving regulations. Candidates may improve their qualifications by taking college or technical school courses in transportation.

Administrative and sales positions frequently are filled by college graduates who have majored in business administration, marketing, accounting, industrial relations, or transportation. Some companies have management training programs for college graduates in which trainees work for brief periods in various departments to get a broad understanding of trucking operations before they are assigned to a particular department. High school graduates may be promoted to administrative and sales positions.

Employment Outlook

Employment in the trucking industry is expected to grow about as fast as the average for all industries through the mid-1980's. In addition to the large number of job openings created by employment growth, thousands more will arise as experienced workers retire, die, or transfer to other fields. The number of jobs may vary from year to year, however, because the amount of freight fluctuates with ups and downs in the economy.

Trucks carry virtually all freight for local distribution and a great deal of freight between distant cities. As the volume of freight increases with the Nation's economic growth, employment in the trucking industry will rise. More employees also will be needed to serve the many factories, warehouses, stores, and homes being built where railroad transportation is not available.

Employment will not increase as fast as the demand for trucking services because technological developments and a continued trend toward larger, more efficient firms will increase output per worker. As a result of these developments, rates of growth will vary among occupations. Employment of material handlers, for example, is expected to increase slowly because of more efficient freight-handling methods—such as conveyors and draglines to move freight in and out of terminals and warehouses. On the other hand, employment of accountants, personnel workers, clerks, and mechanics is expected to increase rapidly as firms increase in size and are able to employ more of these specialists.

Earnings and Working Conditions

In 1974, nonsupervisory workers in the trucking industry averaged $5.79 an hour, compared with $4.22 an hour for their counterparts in all private industry, except farming. Earnings are relatively high in the trucking industry, because highly paid drivers represent a large proportion of employment; many long-distance drivers earn more than $300 a week.

Most employees are paid an hourly rate or a weekly or monthly

salary. However, truckdrivers on the longer runs generally are paid on a mileage basis while driving. For all other worktime, they are paid an hourly rate.

Working conditions vary greatly among occupations in the industry. While drivers may experience nervous strain from maneuvering large trucks in fast-moving traffic, more comfortable seating, power steering, and air-conditioned cabs have reduced physical strain. Long-distance drivers frequently work at night and may spend time away from home; local drivers usually work during the day. Material handlers and truckdrivers' helpers have strenuous jobs, although conveyor systems and other freight handling equipment have reduced some of the heavier lifting and made the work easier and safer. Truck mechanics and other maintenance personnel may have to work in awkward or cramped positions while servicing vehicles, and frequently get dirty because of the grease and oil on the trucks. In addition, most maintenance shops are hot in summer and drafty in the winter. Mechanics occasionally make repairs outdoors when a truck breaks down on the road.

Many large organizations operate around the clock and require some material handling and maintenance personnel to work evenings, nights, and weekends.

A large number of trucking industry employees are members of the International Brotherhood of Teamsters, Chauffeurs, Warehousemen and Helpers of America (Ind).

Sources of Additional Information

For general information about career opportunities in the trucking industry, write to:

American Trucking Associations, Inc., 1616 P St. NW., Washington, D.C. 20036.

Information about specific jobs may be available from the personnel departments of local trucking companies or the local office of your State employment service.

WHOLESALE AND RETAIL TRADE

Wholesaling and retailing are the final stages in the transfer of goods from producers to consumers. Wholesalers assemble goods in large lots for distribution to retail stores, industrial firms, and institutions such as schools and hospitals. Retailers sell goods directly to consumers in a variety of ways—in stores, by mail, or through door-to-door selling. A list of the items sold by wholesale and retail businesses would include almost every item produced by industry—automobiles, clothing, food, furniture, and countless others.

In 1974, about 17 million people (not counting an estimated 2 million who were self-employed persons or unpaid family workers) worked in wholesale and retail trade. The largest number of workers—12.7 million or about three-fourths of them were employed in retail trade. The majority of these workers held jobs in department stores, food stores, and restaurants and other eating places. About 4.3 million people worked in wholesale trade.

Workers with a wide range of education, training, and skills hold jobs in wholesale and retail trade. As shown in the accompanying tabulation, 3 out of 5 workers in these industry divisions were white-collar workers (professional, managerial, clerical, and sales). Sales workers, the largest single group, make up more than one-fifth of total industry employment. Managers and proprietors, the second largest group of workers, constitute nearly one-fifth of the industry's work force. Many managers and proprietors own and operate small wholesale houses or retail businesses, such as food stores and gas stations. Clerical workers make up over one-sixth of the work force; many hold jobs as cashiers, especially in supermarkets and other food stores. Other important clerical occupations in retail trade include secretaries, stenographers and typists, office machine operators, and bookkeepers and accounting clerks. Large numbers of shipping and receiving clerks work in both wholesale and retail trade.

Blue-collar workers (craft workers, operatives, and laborers) constitute nearly one-fourth of the industry's jobholders. Many work as mechanics and repairers, gas station attendants, drivers and delivery workers, meat cutters, and materials handlers. Most mechanics work for motor vehicle dealers and gasoline service stations. A large number of meatcutters work in wholesale grocery establishments and in supermarkets and other food stores.

Service workers, employed mostly in retail trade, constitute about 1 out of 6 workers in the industry. Food service workers, such as waitresses and cooks, make up by far the largest concentration of service workers. Other large groups of service workers are janitors, cleaners, and guards.

Major occupational group	*Estimated employment, 1974 (percent distribution)*
All occupational groups	100
Professional, technical, and kindred workers	2
Managers and administrators	19
Clerical and kindred workers	17
Salesworkers	22
Craft and kindred workers	8
Operatives	10
Service workers	16
Laborers	6

Employment in wholesale and retail trade is expected to increase by about the same rate as the average for all industries through the mid-1980's as sales rise in response to growth in population and income. Due to laborsaving innovations, however, employment is not expected to grow as fast as sales. The use of computers for inventory control and billing, for example, may limit the need for additional clerical workers. Improved methods of handling and storing merchandise will limit the demand for laborers.

The statements that follow discuss job opportunities in restaurants and food stores. More detailed information about occupations that cut across many industries appears elsewhere in the *Handbook*.

OCCUPATIONS IN THE RESTAURANT INDUSTRY

In 1974, the restaurant industry was the fourth largest industry in the country, employing 3.1 million people in establishments ranging from roadside diners to luxurious restaurants. The type of food and service a restaurant offers varies with its size and location, as well as with the kind of customer it seeks to attract. Fast-food restaurants and cafeterias in suburban shopping centers emphasize rapid service and inexpensive meals. Steak houses and pizzerias consider the quality of their specialty most important. Some restaurants cater to customers who wish to eat a leisurely meal in elegant surroundings and their menus often include unusual dishes or "specialties of the house."

Most restaurants are small and have fewer than 10 paid employees; many of these are operated by their owners, who have either no paid help or only one or two part-time workers. An increasing proportion of restaurants, however, are part of a chain operation.

Restaurant jobs are found almost everywhere. Although employment is concentrated in the States with the largest populations and particularly in large cities, even very small communities have luncheonettes and roadside diners.

Restaurant Workers

About three-fourths of all restaurant employees prepare and serve food, and keep cooking and eating areas clean. Waiters and waitresses, and cooks and chefs make up the two largest groups of workers. Others are counter workers, who serve food in cafeterias and fast-food restaurants; bartenders, who mix and serve drinks; dining room attendants, who clear tables, carry dirty dishes back to the kitchen, and sometimes set tables; dishwashers, who wash dishes and help keep the kitchen clean; pantry workers, who prepare salads and certain other dishes; and janitors and porters, who dispose of trash, sweep and mop floors, and keep the restaurant clean. Some of these workers operate mechanical equipment such as dishwashers, floor polishers, and vegetable slicers and peelers. (Detailed information on cooks and chefs, waiters and waitresses, bartenders, food counter workers, and dining room attendants and dishwashers is given elsewhere in the *Handbook*.)

Another large group of restaurant workers—about one-seventh of the total—are managers and proprietors. Many are owners and operators of small restaurants and, in addition to acting as managers, may cook and do other work. Some are salaried employees who manage restaurants for others.

All other restaurant workers combined account for less than one-tenth of total industry employment. Most are clerical workers—cashiers who receive payments and make change for customers; food checkers who total the cost of items selected by cafeteria customers; and bookkeepers, typists, and other office workers. A few restaurants employ dietitians to plan menus, supervise food preparation, and enforce sanitary regulations. Restaurant chains and some large restaurants employ mechanics and other maintenance workers, accountants, advertising or public relations directors, personnel workers, and musicians and other entertainers.

Training, Other Qualifications, and Advancement

The skills and experience needed for restaurant work vary from one occupation to another. Many jobs require no special training or experience, while others require some college or managerial experience. Requirements also vary from one restaurant to another; large or expensive restaurants usually have higher standards than diners or luncheonettes.

Young people who have less than a high school education and no previous experience often can get jobs as kitchen workers, dishwashers, or dining room attendants. Although a high school education is not mandatory, some restaurants hire only those with a diploma or experienced waiters and waitresses, cooks, and bartenders. Special training or many years of experience or both usually are required for chefs' positions.

Newly hired restaurant workers are generally trained on the job. Kitchen workers, for example, may be taught to operate a lettuce-shredder and make salads. Waiters and waitresses are taught to set tables, take orders from customers, and serve food in a courteous and efficient manner. In many restaurants, new employees receive their training under the close supervision of an experienced employee or the manager. Large restaurants and some chain restaurant operations may have more formal programs which often include several days of training sessions for beginners.

Many public and private high schools offer vocational courses for persons interested in restaurant training. Usually included are food preparation and cooking, catering, restaurant management, and other related subjects. Similar training programs are available for a variety

of occupations through restaurant associations and trade unions, technical schools, junior and community colleges, and 4-year colleges. Programs range in length from a few months to 2 years or more.

The Armed Forces are another good source of training and experience in food service work. A number of programs also exist to train handicapped workers for restaurant jobs. Among these are projects to train mentally retarded persons for occupations such as dishwasher and kitchen helper.

When hiring, employers look for applicants who have good health and physical stamina because restaurant workers have to work long hours, often under considerable pressure. Neatness, a pleasant manner, and an even disposition also are important, especially for waiters and waitresses and other employees who meet the public. Restaurants, particularly large chain operations, promote workers who have initiative and ability. Dining room attendants or dishwashers can advance to better paying jobs such as waiter or cook's helper and then through additional training to cook, chef, baker, or bartender. Experience as maitre d'hotel may lead to a position as director of food and beverage services in a large chain organization. Assistant managers, particularly those with college training, may be promoted to manager, and eventually to a top management position.

Employment Outlook

Employment in the restaurant industry is expected to increase faster than the average for all industries through the mid-1980's. In addition to the openings arising from employment growth, thousands of openings are expected each year due to turnover—the need to replace experienced employees who find other jobs or who retire, die, or stop working for other reasons. Turnover is particularly high among part-time workers, many of whom are students.

Most openings will be for waitresses and kitchen helpers—both because of their high replacement needs and because these workers make up a very large proportion of all restaurant employees. Employment opportunities also are expected to be favorable for skilled cooks and salaried restaurant managers. The number of openings in clerical jobs, such as cashier, will be relatively small. A few openings will occur in specialized positions, such as food manager and dietitian.

Population growth, rising personal incomes, and more leisure time will contribute to a growing demand for restaurant services. Also, as an increasing number of wives work, more and more families may find dining out a welcome convenience. Increasing worker productivity, however, will prevent employment from growing as rapidly as demand for restaurant services. Restaurants have become more efficient as fast food service counters have become more popular, and as managers have centralized the purchase of food supplies, introduced self-service, and used precut meats and modern equipment. Many restaurants now use frozen entrees in individual portions which require less time and skill to prepare than fresh foods.

Earnings and Working Conditions

Earnings of restaurant workers depend on the location, size, type, and degree of unionization of the restaurant in which they work. Also, workers in some occupations receive tips in addition to their wages.

In 1974, nonsupervisory workers in the restaurant industry averaged $2.33 an hour (excluding tips). Data from union contracts covering eating and drinking places in several large cities indicate the following range of hourly earnings for individual occupations:

	Hourly rate range [1]
Chefs	$3.00–5.90
Bartenders	2.90–5.40
Cooks	2.60–4.90
Pantry workers	2.16–3.82
Checkers	2.10–3.71
Porters	1.96–3.42
Cashiers	2.10–3.38
Dishwashers	1.31–3.04
Dining room attendants	1.30–3.04
Kitchen helpers	2.19–3.02
Waiters and waitresses	1.20–3.00
Assistant cooks	2.30–2.90
Food counter workers	1.90–2.60

[1] Tips not included.

Salaries of managerial workers differ widely because of differences in duties and responsibilities. Many college graduates who had specialized training in restaurant management received starting salaries ranging from $10,000 to $12,000 annually in 1974. Managerial trainees without this background often started at lower salaries. Many experienced managers earned between $15,000 and $30,000 a year.

In addition to wages, restaurant employees usually get at least one free meal a day, and often are provided with uniforms. Waiters, waitresses, and bartenders also may receive tips.

Most full-time restaurant employees work 30 to 48 hours a week; scheduled hours may include evenings, holidays, and weekends. Many work on split shifts, which means they are on duty for several hours during one meal, take some time off, and then return to work for the next busy period.

Many restaurants have convenient work areas, and are furnished with the latest equipment and laborsaving devices. Others, particularly small restaurants, offer less desirable working conditions. In all restaurants, workers may stand much of the time, have to lift heavy trays and pots, or work near hot ovens or steam tables. Work

hazards include the possibility of burns; cuts from knives and broken glass or china; and slips and falls on wet floors.

The principal union in the restaurant industry is the Hotel and Restaurant Employees and Bartenders International Union (AFL-CIO). The proportion of workers covered by union contracts varies greatly from city to city.

Sources of Additional Information

For additional information about careers in the restaurant industry, write to:

National Institute for the Foodservice Industry, 120 South Riverside Plaza, Chicago, Ill. 60606.

Council on Hotel, Restaurant, and Institutional Education, 1522 K St., NW., Washington, D.C. 20005.

Information on vocational education courses for restaurant work may be obtained from the local director of vocational education, the superintendent of schools in the local community, or the State director of vocational education in the department of education in the State capital.

OCCUPATIONS IN RETAIL FOODSTORES

In the United States, grocery stores and supermarkets are as common as baseballs in summer, and almost always near at hand. But like the tip of an iceberg, the local foodstore is merely a small part of a large body known as the retail foodstore industry. The industry sells most of the food eaten by Americans and employs more than 2.1 million workers.

Jobs in the foodstores vary, and workers range in education and training from high school dropouts to college educated marketing professionals. Jobs in foodstores are especially attractive because employers often provide training and because the opportunities for promotion are good. The large number of opportunities for part-time employment may be of special interest to homemakers and students who do not want full-time jobs.

Nature of the Work

In contrast to restaurants where food is eaten as it is purchased, retail foodstores sell food which is to be eaten away from the store. The industry pioneered in self-service marketing techniques that permit customers to select items from shelves and bring them to check-out stands. Self-service methods reduce the number of employees needed. Therefore the cost of operating a store is lower. As a result, food sold in large self-service foodstores, or supermarkets, is generally less expensive than food sold in small stores.

There are three basic types of food stores: Supermarkets which sell many food items, small grocery stores, and specialty food stores which emphasize a particular type of food, or service, not generally available in a supermarket.

Supermarkets are simply big, self-service grocery stores which sell meat; canned, frozen, or fresh vegetables; baked foods; and other items. Only about 20 percent of all food stores are supermarkets. However, they employ about 60 percent of the industry's workers. Because prices are generally lower than at any other type of foodstore, supermarkets attract customers who make many purchases. When only a loaf of bread or a quart of milk is needed, however, the customer may prefer a nearby neighborhood grocery store or a specialty foodstore.

Small neighborhood grocery stores are the most numerous of all foodstores. Besides a small selection of popular food items, they may feature Spanish, Chinese, or other ethnic foods. Usually, owners personally manage these stores and only employ additional help as needed. Few owners operate more than one store. About 20 percent of the industry's employees work in small grocery stores.

Convenience stores are small grocery stores which specialize in a small variety of food and other items which customers might want in a hurry. They open earlier and close later than large supermarkets, and customers can make purchases quickly. Only 5 percent of the industry's employees work in convenience stores.

Specialty food stores operate in much the same manner as small neighborhood grocery stores. However, they feature only one type of food, such as meat, vegetables, or candy. Most are small and are usually operated by the owner and a few clerks. Approximately 15 percent of the industry's employees work in these stores.

Occupations in the Industry

About 60 percent of foodstore workers are clerks, cashiers, meatcutters, and meatwrappers. Managers and owner-managers make up an additional 25 percent of total employment. The remaining 15 percent are accountants, bookkeepers, truckdrivers, cleaning and other service workers, and laborers.

Clerks in supermarkets are usually called stock or produce clerks. In the grocery department, stock clerks keep shelves filled with merchandise. For example, they may count the cans of soup on the shelves and in the stockroom and decide whether to order more soup from the warehouse. Since storage space is limited, the order should include only as much as might be sold before another delivery from the warehouse will be made.

Stock clerks frequently rearrange food to create an attractive display. They help customers find what they want and perform general clean-up duties. In supermarkets, stock clerks may occasionally operate cash registers or bag groceries.

Produce clerks maintain the displays of fruits and vegetables. Because fruits and vegetables are perishable, clerks use special techniques to keep the stock attractive. Fruits and vegetables are rotated so that the most recently delivered goods are on the bottom of the display. Lettuce and other greens are moistened and chilled to preserve crispness. In addition to caring for the displays, produce clerks help unload delivery trucks, keep the produce department clean, answer customer's questions, and weigh and bag produce.

In large stores which have bakery and delicatessen departments, other clerks work behind counters

selling cakes or lunch meats.

Meatcutters and wrappers order and prepare meats for sale. Since meat is delivered to the store in large pieces, meatcutters use saws and knives to cut the large pieces into roasts, steaks, stew meats, and other meal size portions. After the fat is cut away and bone chips are removed, the meat is placed in plastic trays and is ready to be wrapped.

Meatwrappers use a machine to wrap the package of meat in clear plastic. Then, the wrappers weigh the packages and attach labels which the weighing machine has printed and which identify the type of meat, the weight, the price per pound, and the total price for each package.

At the check-out counter, cashiers ring up the price of each item on the cash register, add sales tax, receive checks or money, make change, and bag purchases.

Cashiers, who are often the only employees customers meet, must be pleasant, courteous, fast, and accurate. Experienced cashiers memorize the prices of hundreds of items, but must detect price changes on cans and boxes. For produce and other items that change price frequently, price lists are used. When not serving customers, cashiers clean counters and restock small convenience items, such as razor blades and candy, displayed near the check-out counter.

Many supermarkets also employ workers to bag and carry groceries from the check-out counter to customers' cars. Cleaning and other service workers polish floors, clean windows, and do other housekeeping jobs. The store manager observes the activities of each department, corrects problems as they arise, and is responsible for all activities and the store's success.

The central administrative offices of supermarket chains employ accountants, bookkeepers, personnel specialists, clerks, secretaries, and other office workers. Chain stores also employ many truckdrivers, stock clerks, and laborers in warehouses.

Training, Other Qualifications, and Advancement

In a large supermarket, a new employee usually begins as a trainee in one of the following occupations: cashier, stock clerk, produce clerk, meatwrapper, or meatcutter. In smaller stores, however, new employees usually are trained as combination cashiers-clerks.

When hiring trainees, employers look for high school graduates who are good at arithmetic and who make a neat appearance. An outgoing personality and the ability to get along with people also are important, particularly for cashiers. Applicants who have less than a high school education may be hired if they qualify in other respects.

New workers learn their jobs mostly by helping and observing experienced employees. A few years may be needed to qualify as a skilled meatcutter, but cashiers and produce clerks generally can learn their jobs in less than 6 months. Jobs as stock clerks and meatwrappers can be learned in even less time.

Before being assigned to a store, cashier trainees may attend a 5-day school operated by a supermarket chain. These courses, which emphasize rapid and accurate operation of cash registers, include instructions for treating customers courteously and for handling complaints. Trainees who pass the examination are assigned to a store to finish their training; those who fail may be hired for other jobs, such as stock or produce clerk.

Some stores have meatcutter apprenticeship programs, which generally last 2 to 3 years, and include classroom instruction as well as on-the-job training.

Foodstores provide ambitious employees with excellent opportunities for advancement in supermarkets, stock clerks frequently move up to better-paying jobs as head clerks or grocery department managers. Produce clerks may advance to jobs produce managers, produce buyer or produce supervisors of several stores. Meatwrappers can learn to be cutters, and then advance to meat department manager. Cashiers and department managers can be promoted to assistant managers and, eventually, managers of a supermarket. Advancement in small foodstores usually is limited, but employees may get all-round experience to start their own small businesses.

Some supermarket employees and managers advance to administrative jobs in their company's central offices. A large number of these jobs, however, are in specialized fields, such as accounting or labor relations, which require college training.

In cooperation with the National Association of Food Chains, Cornell University offers home study courses in management that are designed specifically for food industry employees who wish to improve their chances for advancement. All employees are eligible to take these courses.

Foodstores also have been a growing source of jobs for women. In 1974, about 40 percent of the industry's employees were women, compared with about 30 percent in 1960.

Employment Outlook

The outlook for jobs in the foodstore industry is good. Employment through the mid-1980's is expected to grow about as fast as the average for all industries. In addition, each year thousands of jobs will become available as employees transfer to jobs in other industries, retire, or stop working for other reasons. Many part-time jobs will be available.

As population increases, more food will have to be distributed; this will increase foodstore sales and employment. However, employment is not expected to increase as rapidly as foodstore sales because new equipment will increase employee productivity. For example, computer assisted check-out systems are now being tested as replacements for cash registers. An optical or magnetic scanner transmits the code number of each purchase to a computer that is programmed to record the price of the item, add the tax, and printout a receipt. The computer also keeps track of the store's inventory and places orders with the warehouse when stock is needed. This system would limit growth in the employment of cashiers and stock clerks. Nevertheless, more workers would be hired as additional supermarkets are built to keep up with the expansion of suburbs.

The outlook for part-time jobs as cashiers and stock clerks is very good. Large numbers of the present employees are students who are supplementing their income while attending school. After completing school, many leave for jobs in other industries. Other part-time employees also may work only for short periods. As a result, there are many part-time job opportunities which frequently can lead to full-time jobs.

Earnings and Working Conditions

Earnings of nonsupervisory workers in foodstores are among the highest in retail trade. In 1974, they averaged $3.60 an hour, compared with $3.10 an hour for nonsupervisory workers in retail stores as a whole. Earnings vary considerably by occupation. Based on the limited information available, hourly rates ranged from about $1.60 for clerks with little experience to more than $6.00 for some highly skilled meatcutters. Earnings tend to be highest in large stores in metropolitan areas.

Almost all foodstore employees must be able to stand for several hours at a time. Stock clerks must be capable of lifting boxes or packages which weigh up to 50 pounds. Most foodstore occupations are not hazardous, but meatcutters must be careful when handling knives and using machinery, such as electric saws. Because they frequently work in refrigerated rooms, meatcutters also must be able to tolerate low temperatures (35 to 50 degrees fahrenheit).

Many foodstore employees are union members. Employees in the meat department are represented by the Amalgamated Meat Cutters Union. Other employees in the store belong to the Retail Clerks International Association.

Sources of Additional Information

Details about employment opportunities are available from local foodstores and the local office of the State employment service.

For specific information on the duties and qualifications of cashiers, write to:

National Association of Retail Grocers, 360 North Michigan Ave., Chicago, Ill. 60601.

For information on training and other aspects of the meatcutting trade, contact:

Amalgamated Meat Cutters and Butchers Workmen of North America, 2800 North Sheridan Road, Chicago, Ill. 60657.

FINANCE, INSURANCE, AND REAL ESTATE

Nearly every individual and organization uses services that the finance, insurance, and real estate industry provides. Financial institutions—banks, savings and loan companies, consumer credit organizations, and others—offer services ranging from checking and savings accounts to the handling of stock and bond transactions. Insurance companies provide protection against losses caused by fire, accident, sickness, and death. Real estate firms serve as agents in the sale or rental of buildings and property, and often manage large offices and apartments.

In 1974, over 4.1 million persons worked in the finance, insurance, and real estate field. Finance, the largest sector, employed 1.9 million persons; the next largest, insurance, over 1.4 million workers. The remainder—over 800,000—worked in real estate.

Finance, insurance, and real estate firms are a major source of job opportunities for women, who make up over half of the industry's work force. The proportion of women ranges from about 35 percent in real estate to over 65 percent in banking.

As the accompanying tabulation shows, over 90 percent of the workers in the industry hold white-collar jobs. Clerical workers alone make up 46 percent of the industry's work force. Many clerical workers have jobs that are unique to particular industries, such as bank tellers in financial institutions and claim representatives in insurance companies. Other large clerical occupations include stenographer, typist, secretary, and office machine operator—jobs also found in other industries. Salesworkers constitute 21 percent of the work force. Most of these are insurance and real estate agents and brokers. A relatively small number of the salesworkers sell stocks and bonds.

Major occupational group	*Estimated employment, 1974 (percent distribution)*
All occupational groups	100
Professional, technical, and kindred workers	5
Managers and administrators	20
Clerical and kindred workers	46
Salesworkers	21
Craft and kindred workers	2
Operatives	(1)
Service workers	5
Laborers	1

[1] Less than 0.5 percent.

Managers and officials—bank officers, office managers, and others—make up 20 percent of the industry's work force. Professional and technical workers—such as accountants, computer specialists, and business research analysts—account for another 5 percent.

Employment in the finance, insurance, and real estate industry is expected to increase faster than the average for all industries through the mid-1980's. Over the long run, population, business activity, and personal incomes should continue to rise, creating a need to expand both the types of services offered and the number of establishments engaged in finance, insurance, and real estate. Growth, however, may vary by occupation. For example, the increasing use of data processing should continue to lessen the demand for workers in routine clerical and recordkeeping functions while spurring demand for workers in computer occupations.

OCCUPATIONS IN THE BANKING INDUSTRY

Banks have been described as "department stores of finance" because they offer a variety of services ranging from individual checking accounts to letters of credit for financing world trade. Banks safeguard money and valuables; administer trusts and personal estates; and lend money to business, educational, religious, and other organizations. They lend money to individuals to purchase homes, automobiles, and household items, and to cover unexpected financial needs. Banks continually adapt their services to meet their customers' needs. In recent years, for example, they have offered revolving check credit plans, charge cards, accounting and billing services, and money management counseling.

Banks and Their Workers

Banks employed more than a million workers in 1974; about two-thirds were women. Most bank employees work in commercial banks, where a wide variety of services are offered. Others work in mutual savings banks, which offer a more limited range of services—mainly savings deposit accounts, mortgage loans, safe-deposit rentals, trust management, money orders, travelers' checks, and passbook loans. Still others work in the 12 Federal Reserve Banks (or "bankers' banks") and their 24 branches and in foreign exchange firms, clearing house associations, check cashing agencies, and other organizations doing work closely related to banking. In addition, many people are employed by savings and loan associations, personal credit institutions, and related institutions.

In 1974, commercial banks processed about 25 billion checks and handled an enormous amount of paperwork. The clerical workers who do this job account for nearly two-thirds of all bank employees. Many are tellers or clerks who process the thousands of deposit slips, checks, and other documents which banks handle daily. Banks also employ many secretaries, stenographers, typists, telephone operators, and receptionists.

Bank officers comprise the second largest occupation in the banking industry. Approximately 1 out of 5 employees is an officer—a president, vice president, treasurer, comptroller or other official. Other occupations in the industry account for fewer positions. These include accountants, economists, lawyers, personnel directors, marketing and public relations workers, as well as guards, elevator operators, cleaners, and other service workers.

Three large occupations unique to banking—clerks, tellers, and officers—are described in separate statements elsewhere in the *Handbook*.

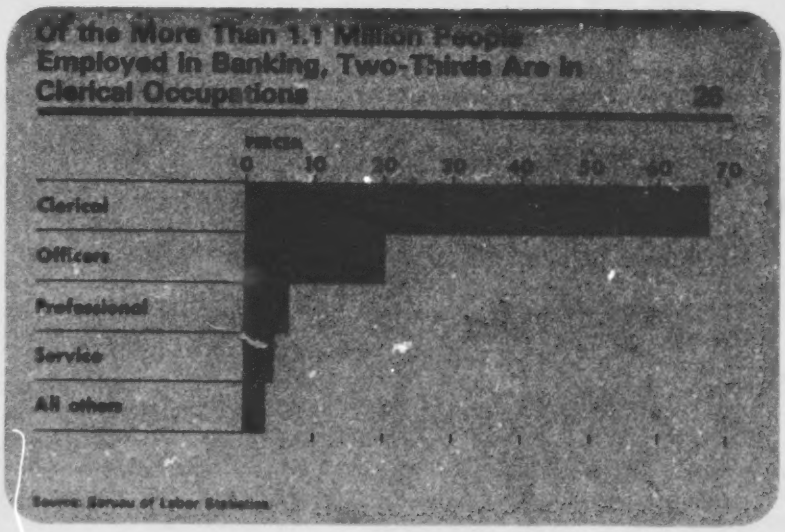
Places of Employment

In 1974, there were more than 40,000 commercial banks and their branches and almost 2,000 mutual savings banks and branches. Bank employment is concentrated in a relatively small number of very large banks. In 1974, for example, almost two-thirds of all commercial bank employees worked in the Nation's 800 largest commercial banks; less than 6 percent were employed by the 6,000 smallest commercial banks.

Most bank employees work in heavily populated States, such as New York, California, Illinois, Pennsylvania, and Texas. New York City, the financial capital of the Nation, has far more bank workers than any other city.

Training

Professional and managerial



bank workers usually have completed college; most clerks have finished high school; guards and building service personnel may have less than a high school education.

Most new employees receive some form of in-service bank training. Banks also provide other opportunities for workers to broaden their knowledge and skills. Many banks encourage employees to take courses at local colleges and universities. In addition, banking associations sponsor a number of programs, sometimes in cooperation with colleges and universities. Many banks pay all or part of the costs for those who successfully complete courses.

Bank workers also can prepare for better jobs by taking courses that the American Institute of Banking offers in many cities throughout the country. The Institute, which has 387 chapters and over 200 study groups, also offers correspondence study and assists local banks in conducting cooperative training programs for various bank positions.

Bank employees should enjoy working with numbers and be able to accept the responsibility of handling large amounts of money. They should present a good image to customers. Often bank officials are encouraged to participate in community activities.

Employment Outlook

Banks should continue to be a major source of job opportunities in office occupations. Banking employment is expected to rise faster than the average for all industries through the mid-1980's. New jobs resulting from employment growth, as well as those that arise as employees retire, die, or stop working for other reasons, are expected to account for tens of thousands of openings each year.

Most openings will be for clerks. In addition, an increasing number of trainee jobs, which may lead to officer positions, will probably become available for college graduates. Many openings for professional and specialized personnel such as accountants and auditors, statisticians, and computer operators also will occur.

Bank facilities and employment will grow as population, sales, and incomes rise, resulting in greater numbers of financial transactions among businesses and individuals. Jobs also will be created as banks continue to improve and expand services such as bank charge cards and the handling of accounts for retail stores. As banks strive to bring these and other services closer to suburban areas, branch banks will grow in number and provide additional employment opportunities.

The continued conversion to electronic data processing may lessen demand for some bank workers, despite the expected increase in bank services. The effect of this development will vary by occupation, as indicated in the statements on specific banking occupations elsewhere in the *Handbook*.

Bank employees can anticipate steadier employment than workers in many other fields, because they are less likely to be laid off during periods of low business activity. Even when a bank is sold or merged, workers seldom lose their jobs. Bank officials usually reduce employment, when necessary, by not replacing employees who leave their jobs.

Earnings and Working Conditions

In addition to salaries, bank workers generally receive liberal fringe benifits. For example, most banks have some type of profit-sharing or bonus plan. In addition, group plans that provide life insurance, hospitalization, surgical benefits, and retirement income are common. Sometimes free checking accounts or safe-deposit boxes also are provided.

The workweek in banks is generally 40 hours or less; in a few localities, a workweek of 35 hours is common. Tellers and some other employees work at least one evening a week when banks remain open for business. Certain check processors and operators of computing equipment may work on evening shifts.

Sources of Additional Information

Local banks and State bankers' associations can furnish specific information about job opportunities in local banking institutions. General information about banking occupations, training opportunities, and the banking industry itself is available from:

American Bankers Association, Bank Personnel Division, 1120 Connecticut Ave. NW., Washington, D.C. 20036.

National Association of Bank Women, Inc., National Office, 111 E. Wacker Dr., Chicago, Ill. 60601

National Bankers Association, 4310 Georgia Ave. NW., Washington, D.C. 20011.

For information about career opportunities as a bank examiner, contact:

Federal Deposit Insurance Corporation, Director of Personnel, 550 17th St. NW., Washington, D.C. 20429.

Information on careers with the Federal Reserve System is available from:

Board of Governors, The Federal Reserve System, Personnel Department, Washington, D.C. 20551 or from the personnel department of the Federal Reserve bank serving each geographic area.

OCCUPATIONS IN THE INSURANCE INDUSTRY

The insurance industry offers many employment opportunities both for recent high school and college graduates and for experienced workers.

The 1,800 life and 2,800 property-liability (also called casualty) insurance companies do business in home and regional offices and also in thousands of sales offices throughout the country.

Nature of the Business

There are three major types of insurance: life, property-liability, and health. Some companies specialize in only one type; a growing number of large insurers now offer several lines of insurance. For example, several life carriers can now offer their policyholders protection for their homes and cars; at the same time, major property-liability companies sell life insurance policies. Many insurance companies also offer mutual fund shares and variable annuities as additional investment choices for their customers.

Life insurance companies sell policies that provide benefits to survivors upon the death of the insured. Some life insurance policies also provide policyholders with a steady income when they reach retirement age or if they become disabled; policies may be designed to help provide funds to educate children when they reach college age, or give extra financial protection while the children are young. Life insurance policies also may be used to protect business interests and to guarantee employee benefits. Property-liability insurance provides policyholders with protection against loss or damage to their property, and protects them from financial responsibility for injuries to others or damage to other people's property. It covers hazards such as fire, theft, and windstorm, as well as workers' compensation and other claims. Most life and property liability companies sell accident and health insurance, which helps policyholders pay medical expenses, and may furnish other benefits for an injury or illness.

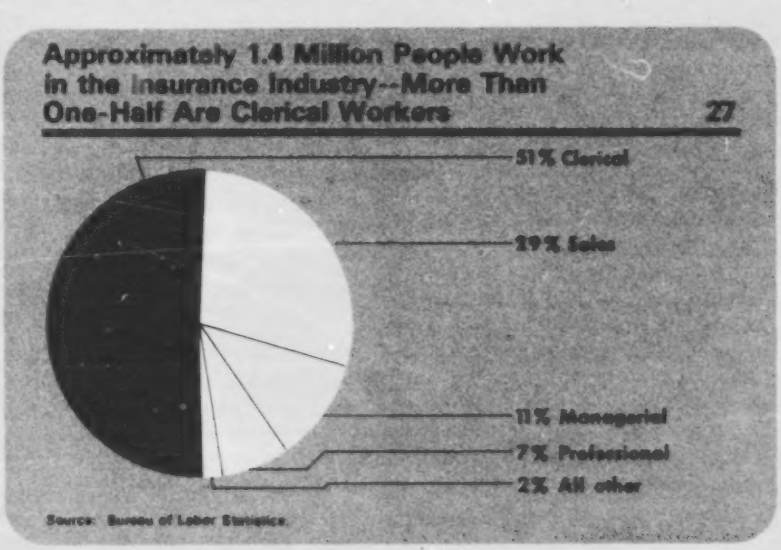
An increasing number of insurance policies cover groups ranging from a few individuals to many thousands. These policies usually are issued to employers for the benefit of their employees. Most common are group life and health plans, although the number of group automobile and homeowner policies is growing rapidly. In 1974, group life insurance protected about 65 million persons; the number of policies was almost double the number 10 years earlier.

Insurance Workers

About 1.6 million people worked in the insurance business in 1974. The majority were in clerical and sales jobs. (See accompanying chart.)

Just over half of all insurance company employees work in clerical and related jobs; this is a much larger proportion than in most other industries. These workers keep records of premium payments, services, and benefits paid to policyholders. Most are secretaries, stenographers, typists, office machine operators, or general office clerks. They do work similar to that of their counterparts in other businesses.

Other clerical workers have positions of greater responsibility that require extensive knowledge of some phase of insurance. They include *claim adjusters* (D.O.T. 241.168) and *claim examiners* (D.O.T. 249.268) who decide whether claims are covered by the policy, see that payment is made,



and, when necessary, investigate the circumstances surrounding the claim. (See the statement on Claim Representatives elsewhere in the *Handbook*.)

Nearly one-third of all insurance employees are salesworkers—chiefly agents and brokers who sell policies to individuals and business firms. *Agents and brokers* (D.O.T. 250.258) usually find their own customers or "prospects," and see that each policy they sell is tailored to meet the individual needs of the policyholder. (See the statement on Insurance Agents and Brokers elsewhere in the *Handbook*.)

About 1 out of 9 insurance workers has a managerial job. Managers of local sales offices often spend part of their time selling. Others, who work in home offices, are in charge of departments such as actuarial calculations, policy issuance, accounting, and investments.

Professionals, employed mainly at home offices, represent about 1 out of 15 insurance workers. These specialists, who work closely with insurance company managers, study insurance risks and coverage problems, analyze investment possibilities, prepare financial reports, and do other professional work. Among them is the *actuary* (D.O.T. 020.188) whose job is unique to the insurance field. Actuaries make studies of the probability of an insured loss and determine premium rates. (See the statement on Actuaries elsewhere in the *Handbook*.) Another specialist is the *underwriter* (D.O.T. 169.188), who evaluates insurance applications to determine the risk involved in issuing a policy. Underwriters decide whether to accept or reject the application; they also determine which premium rate should apply for each policy issued. (See the statement on Underwriters elsewhere in the *Handbook*.)

Other professional employees do essentially the same work in insurance companies as in other businesses. Accountants, for example, analyze insurance company records and financial problems relating to premiums, investments, payments to policyholders, and other aspects of the business. Safety engineers, fire protection engineers, and industrial hygienists in casualty companies work as consultants to industrial and commercial policyholders on matters concerning the health and safety of their employees. (See the statement on Occupational Safety and Health Workers elsewhere in the *Handbook*.) Lawyers interpret the regulations that apply to insurance company operations and handle the settlement of some insurance claims. Investment analysts evaluate real estate mortgages and new issues of bonds and other securities, analyze investments held by their companies, and recommend when to hold, buy, or sell. As more computers are installed to handle office records, an increasing number of programmers, systems analysts, and other data processing specialists are being employed. Many companies also employ editorial, public relations, sales promotion, and advertising specialists.

Insurance companies require the same kinds of custodial and maintenance work as other large organizations. About 1 out of 45 workers in the insurance business performs these duties.

Places of Employment

Many insurance employees work in California, Connecticut, Illinois, Massachusetts, New Jersey, New York, and Texas, where some of the largest insurance companies have home offices. In addition, large numbers are employed in company sales offices, independent agencies, and brokerage firms throughout the country. Almost all sales personnel work out of local offices; most professional and clerical workers, however, are employed in company regional and home offices.

About half of all insurance employees work in life companies and agencies; included in this group are some very large companies with thousands of employees. Property-liability companies, although more numerous than life insurance companies, generally have fewer workers. Many local agencies and sales offices also are small, regardless of the types of insurance handled.

Training, Other Qualifications, and Advancement

Insurance offers job opportunities for people with different educational backgrounds and talents. Some positions require specific college training; others can be filled by workers with limited academic training and few skills.

Graduation from high school or business school is enough training for most beginning clerical jobs. Courses in typing and business math are assets; the ability to operate office machines also is helpful. These and other special skills help beginners advance to more responsible jobs.

Jobs in engineering, accounting, and other professional fields generally require the same kinds of college training here as in other businesses. College-trained people also are preferred for managerial positions, many of which are filled by promotion from within.

In all work requiring contact with the public, employees should have a pleasant disposition and an outgoing personality. Those in frequent contact with policyholders should be able to inspire confidence in their ability to protect the customer's interests. Because insurance companies often encourage their managers and administrative employees to participate in community organizations, they should be people who enjoy working with others in a social situation.

Insurance workers have ample opportunity to continue their education. The Insurance Institute of

America, for example, has home study courses for claim adjusters, claim examiners, underwriters, and salesworkers. The American College of Life Underwriters, the National Association of Life Underwriters, and the Life Underwriter Training Council offer courses that stress the services agents provide to policyholders. Other courses, especially designed to help clerical employees better understand life insurance, relate to the organization and operation of both home and field offices. These are given by the Life Office Management Association, which also provides programs for the development of supervisors and managers.

Employment Outlook

Employment of insurance workers is expected to increase about as fast as the average for all occupations through the mid-1980's as the insurance industry continues to expand. In addition to new jobs that will become available, thousands of openings will occur as employees die, retire, or leave their jobs to seek other work.

The expected increase in employment will result mainly from a growing volume of insurance business. As a larger proportion of the population enters the age group normally associated with family formation, higher incomes, and greater consumer spending, insurance sales should expand. Sales of life insurance will rise as the growing number of young adults attempt to provide a secure future for their families. Property-liability insurance sales should expand as they buy homes, cars, and other items that require insurance protection. More business insurance will be needed as new plants are built, new equipment is installed, and more goods are shipped throughout the country and the world. Furthermore, as the coverage of State workers' compensation laws is broadened, more employers may need this type of insurance protection.

Growth of insurance employment, however, is not expected to keep pace with the expanding volume of business for several reasons. Salesworkers are expected to become more productive as more insurance is sold through group contracts and multiple-line policies (those which cover many different risks formerly covered in separate policies). Although the total number of clerical jobs probably will continue to rise, the increasing use of computers to do routine jobs will lessen the demand for many low-skilled clerical workers. Because the computer can write simple policies, the underwriter occupation may not grow as rapidly as in the past. In addition, State "no-fault" insurance plans should reduce the number and complexity of automobile claims to be adjusted, thus lessening the demand for automobile claim adjusters.

The insurance industry has always been a stable employer and most insurance workers have better prospects of regular employment than workers in many other industries. Business people usually regard property-liability insurance as a necessity, both during economic recession and in boom periods. Individuals who buy insurance try to provide as much basic financial protection as possible, even when their incomes decline.

Earnings and Working Conditions

A 1974 survey of insurance companies, banks, and related businesses revealed a wide range of clerical salaries. Some clerks in beginning routine jobs earned less than $90 a week; experienced clerical employees in more responsible positions earned up to twice that amount.

Differences in clerical salaries reflect variations in specific job duties and differences among insurance companies. Salary levels in different parts of the country also vary; earnings are generally lowest in southern cities and highest in northeastern and western metropolitan areas. (See the chapter on Office Occupations for additional information about earnings of clerical workers.)

Starting salaries for professional workers are generally comparable to those for similar positions in other businesses. According to information available from private surveys of life and property-liability insurance companies, 1974 college graduates started at salaries ranging from $7,500 to $11,000 a year. Specialists with graduate degrees or several years' experience may receive considerably higher starting salaries. Unlike salaried professional workers, agents and brokers earn commissions on the policies they sell. (See the statement on Insurance Agents and Brokers elsewhere in the *Handbook*.) Annual salaries for supervisors in life and property-liability companies ranged from $12,000 to $20,000, depending upon the type of company operation involved.

Except for agents and brokers who sometimes must extend their working hours to meet with prospective clients, insurance company employees worked an average of 37 hours a week in 1974. The number of paid holidays is somewhat greater than in many other industries. Two-week paid vacations generally are granted employees after 1 year of service; in most companies, paid vacations are extended to 3 weeks after 5 years and, in some, to 4 weeks after 10 years. Practically all insurance company workers share in group life and health plans, as well as in retirement pensions.

Sources of Additional Information

General information on employ-

ment opportunities in the insurance business may be obtained from the personnel departments of major insurance companies or from insurance agencies in local communities.

Other information on careers in the insurance field is available from:

Institute of Life Insurance, 277 Park Ave., New York, N.Y. 10017.

Insurance Information Institute, 110 William St., New York. N.Y. 10038.

American Mutual Insurance Alliance, 20 N. Wacker Dr., Chicago, Ill. 60606.

National Association of Insurance Women, 1847 E. 15th St., Tulsa, Okla. 74104.

SERVICE AND MISCELLANEOUS INDUSTRIES

An increasing share of our national wealth is being devoted to services as a result of greater emphasis on amenities such as medical care, education, and recreation. In many ways, this trend reflects the country's goals of a better and fuller life for all its citizens.

In today's job market, the service industries are therefore an important source of employment, for new workers as well as experienced ones, and they offer job opportunities to people with various levels of skills, training, and education.

In 1974, nearly 30 million people worked in service industries. About one-half were wage and salary workers in private firms, 12.3 million more were government employees (mainly in educational and medical services), and 2.2 million were self-employed. The remainder, about 1.4 million, worked in private households.

Educational services, including elementary and secondary schools and institutions of higher education, make up the largest sector of the service industry, and account for over one-fourth of its work force. Hospitals and other establishments that provide health services constitute the next largest sector, and account for nearly one-eighth of the workers. In both these service industries, government workers (mainly local and State) make up a large share of the work force. Other service industries employing many workers are hotels, laundries, private households, business and repair services, and entertainment.

As shown in the accompanying tabulation, white-collar workers (professional, managerial, clerical, and salesworkers) account for over three-fifths of the service industry's employment. The industry employs the highest proportion of professional, technical, and kindred workers of any major industry and these workers account for one-third of the industry's employment. By far the largest concentration of professional personnel is represented by teachers in educational services. Other major employers of professional workers are medical and health services—where doctors, dentists, and nurses constitute a large share of the work force. Many professionals are self-employed. Clerical workers account for 1 out of 5 service industry employees. Most are stenographers, typists, secretaries, and office machine operators. Managers, officials, and proprietors, including health services administrators, make up a relatively small fraction of the industry's employment.

Service workers represent nearly one-third of the industry's employment. Some large service occupations are private household worker, practical nurse, hospital attendant, janitor, waiter or waitress, cook, and protective service worker.

Blue-collar workers, mainly skilled craft workers and semiskilled operatives, constitute only one-ninth of the industry's employment. Many of the craft workers are mechanics in automobile and other repair service industries, or maintenance workers in hotels, schools, and other establishments. Operatives work mainly in laundries, auto repair shops, and other types of repair businesses. Most of the relatively few laborers in this industry work in auto repair shops, on golf courses, and in bowling alleys.

Major occupational group	*Estimated employment, 1974 (percent distribution)*
All occupational groups	100
Professional, technical, and kindred workers	33
Managers and administrators	8
Clerical and kindred workers	20
Salesworkers	1
Craft and kindred workers	5
Operatives	4
Service workers	28
Laborers	2

NOTE: Because of rounding, sum of individual items does not equal total.

Employment in the service industry is expected to increase much faster than the average for all industries through the mid-1980's. The sharp growth in the demand for services is expected to stem from population growth, expanding business activity, and rising personal incomes. The fastest growing parts of the service industry will be hospitals, medical services, and certain firms that provide computer services and laboratory research facilities.

The need for extensive personal contact in the many service functions tends to limit the effect of technological innovations on employment requirements. Although computers may slow the employment growth in some areas—for example, in bookkeeping—technological change is not expected to limit the total demand for

workers in the service industry.

The statements that follow discuss job opportunities in the hotel and laundry and drycleaning industries. More detailed information about services related to occupations that cut across many industries appears elsewhere in the *Handbook*.

HOTEL OCCUPATIONS

Hotels, motels, and resorts provide lodging to suit the needs of every traveler. Some motels offer inexpensive basic services for those who simply want a comfortable place to sleep. Other motels and most hotels cater to persons who desire more luxurious surroundings and offer swimming pools, fine restaurants, and more personalized service. More than 835,000 people, about half of them women, were employed in the industry in 1974.

Some hotel occupations require little or no specialized training. Bellhops, waiters and waitresses, and cleaning workers, for example, usually learn their skills on the job. For many kinds of hotel work, however, demand for persons with special skills or college training is increasing as hotels and motels grow in size, and as chain operations become an ever-larger part of the industry.

This statement describes the jobs usually found in hotels, motels, resorts, and tourist courts. More detailed descriptions of the work of hotel housekeepers, managers, front office clerks, and bellhops are found elsewhere in the *Handbook*.

The Hotel Business

Hotels range in size from those with only a few rooms and employees to huge establishments with more than 1,000 rooms and many hundreds of workers. Many of the motels built in recent years are fairly large and employ many workers, but the economy motels and most older motels have relatively small staffs. Some motels are run entirely by individual owners and their families.

Nearly all hotels and many motels offer a variety of conveniences for their guests, including restaurants, banquet rooms, meeting rooms, swimming pools, and gift shops. Motels usually have simple coffee shops, while hotels often have several restaurants and may offer live entertainment in one of them at night. Hotels and motels in resort areas often have recreational facilities, such as golf courses and tennis courts, in addition to swimming pools. Large hotels also may have newsstands, barber and beauty shops, laundry and valet services, and theater and airline ticket counters.

Hotel Workers

To provide the many services they offer, hotels and motels employ workers in a wide variety of occupations. Housekeeping is a very important part of the business and more than a fourth of all workers are concerned with keeping hotels and motels clean and attractive. The cleaning staff make beds, provide guests with fresh linens and towels, vacuum rooms and halls, and move furniture. Linen room attendants and laundry room workers mark and inspect towels, sheets, and blankets and operate the washing and pressing machines in the hotel laundry. Large hotels and motels usually employ executive housekeepers to supervise these workers and purchase housekeeping supplies. Some hotels also employ managers to supervise laundry operations.

The next largest group of hotel workers are food service personnel. These workers include cooks and chefs, waiters and waitresses, and bartenders who work in the coffee shops and restaurants found in most motels and hotels. Detailed descriptions of their duties are found elsewhere in the *Handbook*.

Hotel managers and assistants are responsible for the profitable operation of their establishments. They determine room rates, oversee restaurant operations, and supervise the hotel or motel staff. In smaller hotels and motels a general manager performs all these tasks, but in large hotels a general manager usually has several assistants, each one responsible for a separate department, such as food service, sales, or personnel.

Nearly all hotels and motels employ clerical workers to take room reservations, bill guests, and furnish information. Most of these workers are front office clerks who greet guests, assign rooms, handle mail, and collect payments. The remainder are bookkeepers, telephone operators, secretaries, and other clerical workers, whose jobs in hotels are much like clerical jobs elsewhere.

Most hotels and some motels employ a uniformed staff to perform services for guests. This staff includes bellhops, who carry baggage and escort guests to their rooms; doorkeepers, who help guests out of their cars or taxis and carry baggage into the hotel lobby; and elevator operators.

In addition, hotels employ many other workers who are also found in other industries. Among these are accountants, personnel workers, entertainers, and recreation workers. Maintenance workers, such as carpenters, electricians, stationary engineers, plumbers, and painters, also work for hotels. Still other workers employed in hotels include detectives, barbers, cosmetologists, valets, and gardeners. Most of these occupations are discussed elsewhere in the *Handbook*.

Employment Outlook

Employment in this industry will expand about as fast as the average for all industries through the mid-1980's as new hotels and motels are built to take advantage of interstate highway or resort locations. In addition to openings resulting from growth, thousands of workers will be needed each year to replace those who retire, die, or transfer to other industries.

Most of the anticipated employment growth will stem from the need to staff new hotels and motels. Employment is expected to increase in both luxury and economy motels as Federal expenditures for highways and other transportation systems stimulate travel. Employment may decline, however, in older hotels, and those unable to modernize are likely to experience low occupancy rates that may force them to reduce costs by eliminating some services and workers. Thousands of temporary jobs will continue to be available each year in resort hotels and motels that are open only part of the year.

Most of the job openings in hotels and motels will be for workers who need little specialized training, such as cleaners, porters, and some dining room employees. Large numbers also will be needed in front office jobs, but opportunities may be limited by the increasing use of computer reservation systems in hotel and motel chains.

Opportunities will be favorable for persons with training or experience as cooks and chefs or as food managers.

Earnings and Working Conditions

Earnings of hotel workers depend on the location, size, and type of the hotel in which they work. Workers in some occupations receive tips in addition to wages that add substantially to their income. Nonsupervisory workers in the hotel industry averaged $2.62 an hour in 1974, excluding tips—about half the average for all nonsupervisory workers in private industry, except farming. About one-half of all hotel workers are covered by Federal and State minimum wage laws; in 1974, workers covered by these laws earned at least $2 an hour.

A 1973 survey of earnings in selected hotel occupations in metropolitan areas indicates that earnings of front office clerks ranged from $2.09 to $3.88 an hour, with an average of $2.56. Bellhops' earnings ranged from $1.99 to $5.71, including tips, with an average of $3 an hour. Tips represent a significant source of income for bellhops, ranging from 23 to 74 percent of their total income.

Salaries of hotel managers and assistants vary greatly, mainly because of differences in duties and responsibilities. Hotel manager trainees who are graduates of specialized college programs start at yearly salaries ranging from $8,000 to $12,000, and are usually given periodic increases for the first year or two. Experienced managers may earn several times as much as beginners; a few, in top jobs, earn $50,000 a year or more. In addition to salary, hotels customarily furnish managers and their families with lodging in the hotel, meals, parking facilities, laundry, and other services.

Since hotels are open round the clock, employees must work on shifts. Fewer employees work at night than during the day and they usually receive additional compensation. Managers and housekeepers who live in the hotel usually have regular work schedules, but they may be called on at any time.

Waiters and waitresses, cooks, pantry workers, dishwashers, and other kitchen workers commonly receive meals; in a few hotels, cleaners, elevator operators, and room clerks also receive meals. Most employees receive 5 to 8 paid holidays a year, paid vacations, and medical benefits.

The Hotel and Restaurant Employees and Bartenders International Union is the major union in the hotel business. Uniformed personnel, such as bellhops and elevator operators, may be members of the Building Service Employees' International Union.

Sources of Additional Information

Information on careers in hotel work may be obtained from:

The Educational Institute of the American Hotel and Motel Association, 1407 S. Harrison Rd., East Lansing, Mich. 48823.

For additional information on hotel training opportunities and a directory of schools and colleges offering courses and scholarships in the hotel field, write to:

Council on Hotel, Restaurant, and Institutional Education, Suite 219, 11 Koger Executive Center, Norfolk, Va. 23502.

Information on housekeeping in hotels is available from:

National Executive Housekeepers Association, Inc., Business and Professional Building, Gallipolis, Ohio 45631.

OCCUPATIONS IN LAUNDRY AND DRYCLEANING PLANTS

In 1974, approximately 430,000 persons were employed by establishments that launder and dryclean garments, household furnishings, and institutional linens and uniforms. These workers were employed throughout the country, but were concentrated in metropolitan areas.

Drycleaning firms and laundries accounted for about three-fourths of the industry's workers. Most of the remainder worked for firms that specialized in renting and cleaning uniforms, towels, diapers, and other linens. A small proportion were employed in valet shops.

More than half of the industry's employment is found in firms that have 20 employees or more. Most firms, however, are owner-operated and have fewer than 10 employees. In 1974, about one-tenth of the industry's workers were self-employed.

Nature of the Work

One way to describe the work done in this industry is to follow an imaginary bundle of clothes from the time it leaves the customer until it is cleaned and returned. (See accompanying chart.) The bundle consists of some men's shirts, a business suit, and bed linens. A *route driver* (D.O.T. 292.358) picks up the bundle and, after leaving a receipt, takes the bundle to the plant.

The owner of the bundle may instead leave it at the plant or drive-up store. In this case, a *counter clerk* (D.O.T. 369.887) makes out a receipt. Either the route driver or the counter clerk sorts the items in the bundle into laundry and drycleaning.

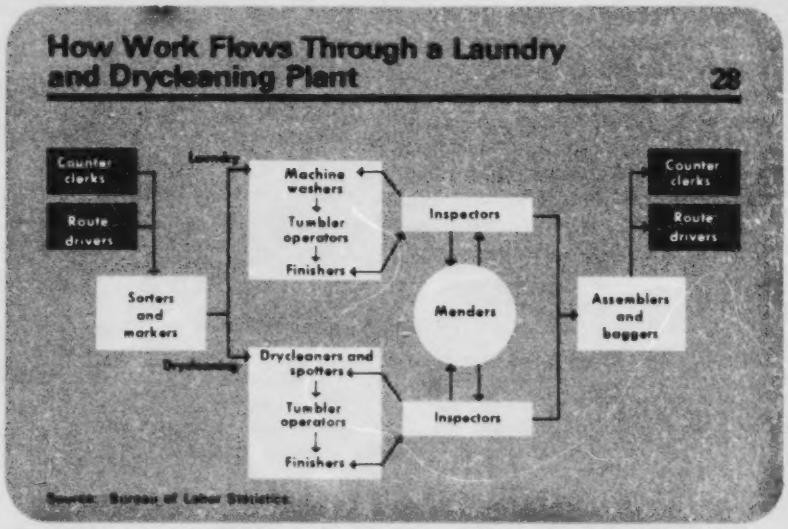
The bundle is turned over to a *marker* (D.O.T. 369.887), who puts an identifying symbol on each item so it may be matched with the customer's receipt at some later time. The marker then sends the shirts and sheets to the washroom and the suit to the drycleaning room.

A *machine washer* (D.O.T. 361.885) puts several hundred pounds of sheets into a huge washing machine. Shirts are loaded into another washer. These machines are controlled automatically, but the machine washer must understand how to operate the controls—water temperature, suds level, time cycles, and the amount of agitation for different fabrics. When the washing cycle is completed, the laundry is transferred to an extractor that removes about half of the water. This stage is similar to the "spin" cycle on a home washer. Conveyors move the laundry to conditioners, dryers, or tumblers where dry, heated air removes some of the remaining moisture.

The sheets go from the drying area to *flatwork finishers* (D.O.T. 363.886), who shake out folds and creases, spread the sheets on moving belts, and feed them into large flatwork ironing machines for ironing and partial folding. When the sheets come out of the machine, other finishers complete the folding and stacking.

Shirts go directly from the extractor to *shirt finishers* (D.O.T. 363.782), who usually work in teams of two or three. One finisher puts the sleeves of the shirt on a "sleever," which has two armlike forms. A second finisher then puts the shirt on a "triple-head" press that irons the front and back simultaneously. In some plants, the first finisher either folds the shirt or places it on a hanger, whichever the customer has indicated. A third finisher may do the folding. In some laundries, one shirt finisher performs all these operations.

The jobs of the *drycleaner* (D.O.T. 362.782) and *machine washer* (D.O.T. 361.885) are



similar, but the cleaning solution for drycleaning is a chemical solvent instead of water, and drycleaning machines generally are smaller than the laundry washers. The drycleaner sorts clothes according to color, fiber content, and fabric construction and selects the proper time cycle for each load. The drycleaner may apply special prespoting solutions to spots and stains before placing the garments in the drycleaning machine. After cleaning, a special machine removes the solvent and then the clothes are dried in a tumbler or hot-air cabinet. The *spotter* (D.O.T. 362.381) will use chemical reagents and steam to remove stubborn stains.

If the clothes are made of a material that sheds wrinkles readily, the finisher places them on hangers and puts them in a steam tunnel or steam cabinet. The steam will remove the wrinkles and help the garment regain its shape.

Some clothes, such as men's suits, are made out of fabrics that require more attention; they are finished differently. A *men's suit finisher* (D.O.T. 363.782) puts the pants on special "topper" and "legger" presses. The jacket is placed on a body form that may have a second part that comes down to press and shape the shoulders and collar of the jacket while the steam is forced from the inside. Final finishing touches are done on a steam-heated pressing head and "buck," a flat surface covered in fabric.

An *inspector* (D.O.T. 369.687) checks finished items to see that the quality standards of the plant have been maintained. Any item in need of recleaning or refinishing may be returned to the appropriate department; occasionally, the inspector works on them instead. Repair work may be forwarded to a *mender* (D.O.T. 782.884), who sews on buttons, mends tears, and resews seams. Finally, *assemblers* (D.O.T. 369.687) collect the linens and shirts by matching the sales invoice with the identification marks. Assemblers or *baggers* (D.O.T. 920.887) may remove tags before putting the items in bags or boxes for storage until called for by the customer or delivered by the route driver.

In addition to workers who are unique to laundry and drycleaning plants, many other workers are found in this industry. The manager or proprietor is responsible for seeing that the work of the plant is performed efficiently. Office workers keep records, handle correspondence, and prepare bills. Sales personnel develop new customers for the plant's services. Mechanics keep equipment and machinery operating properly. Some service workers clean, guard, and otherwise maintain the plant; others plan and serve food to plantworkers. Laborers lift and carry heavy loads to machines. (Discussion of many of these occupations can be found elsewhere in the *Handbook*.)

Training, Other Qualifications, and Advancement

Many workers in this industry get their first jobs without previous training. Persons who have little formal education can get production line jobs in drycleaning plants. Many employers will hire applicants who do not speak English. Basic laundry and drycleaning skills may be learned on the job in a short time. Some jobs, such as folding towels and feeding pillowcases and sheets into a flatwork ironer, may require 1 or 2 days to learn. Some finishing jobs—pants presser, or shirt finisher, for example—may require less than a week's training. Other jobs, such as counter clerk, marker, inspector, and assembler, may require several weeks to learn. Several months or more are needed to train a drycleaner or women's apparel finisher. It may take 6 to 12 months to become a spotter because of the variety of fibers and fabrics, spots and stains, and chemicals used in treating the stains.

Some preemployment training in finishing, drycleaning, and spotting skills is available in vocational high schools and trade schools. Home study courses are available from the International Fabric Care Institute.

Employers look for workers who are dependable and who have physical stamina, manual dexterity, and keen eyesight. Workers must be able to adjust to the repetitive nature of many laundry and drycleaning jobs.

Advancement for most workers in this industry is limited. Many remain permanently in the same job. Nevertheless, employers occasionally send promising employees to technical or managerial training programs or seminars on topics of general interest given by the International Fabriccare Institute at its facility in Joliet, Ill. Some men's suit finishers become skilled enough to do women's apparel finishing. Markers and assemblers interested in finishing work usually are given an opportunity to move up to this job. Finishers also may become inspectors. Supervisors and managers frequently are chosen from experienced employees already in the industry. Some drycleaners and spotters establish their own drycleaning plants.

Employment Outlook

Employment in this industry is expected to decline through the mid-1980's. Laborsaving machinery and more efficient methods of cleaning and finishing laundry will enable the industry to do more work with fewer employees. Nevertheless, thousands of workers will be hired to replace those who retire, die, or transfer to other fields.

Although the industry's total employment is expected to decline, employment trends will differ among occupations. Employment of spotters is expected to decline

because new fibers and finishes make fabrics less stainable. The number of finishers should decrease as machinery does more of the finishing work. On the other hand, more people will be needed in some maintenance occupations to repair the increasing amount of machinery and equipment used by laundry and drycleaning firms. More counter clerks will be required due to growth in the number of retail outlets operated by these firms.

Earnings and Working Conditions

Wage levels in the laundry and drycleaning industry are not high. In 1974, the hourly average wage for nonsupervisory workers in this industry was $2.80 compared to $4.22 for all nonsupervisory workers in private industry, except farming. Earnings are higher for workers in the more highly skilled occupations such as drycleaner, spotter, and machine washer.

Modern laundry and drycleaning plants are clean and well lighted. Because of the heat, hot air, and steam of the cleaning processes, the plant may be hot during the summer months. However, large modern laundries usually have high ceilings—often three stories high—and numerous windows that may be opened for ventilation. Many new, small drycleaning plants are air-conditioned in the office and customer areas and well ventilated in the machinery areas. In addition, new machinery operates with a minimum of noise. Work in laundries and drycleaning plants is less hazardous than in most manufacturing plants.

Sources of Additional Information

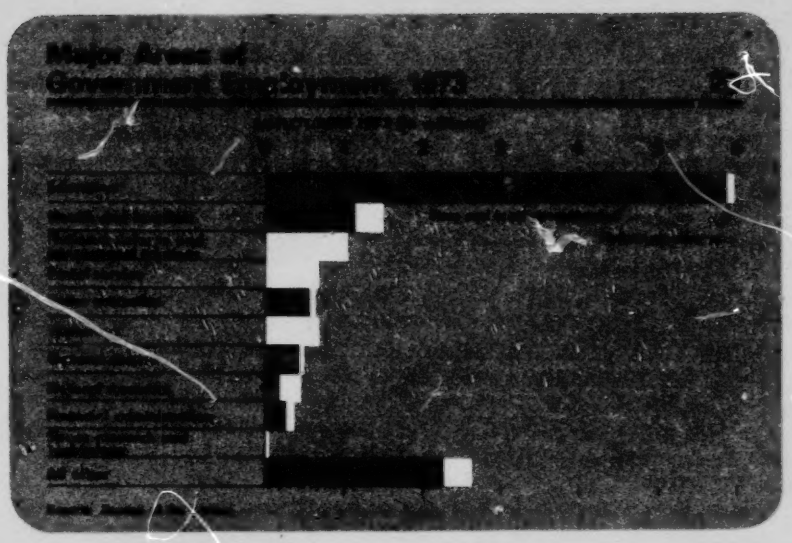
The local office of the State employment service may have additional information on training and employment opportunities in this field.

GOVERNMENT

Government service, one of the Nation's largest fields of employment, provided jobs for over 14.5 million civilian workers in 1974, about 1 out of 6 employed persons in the United States. State or local governments (county, city, town, village, or other local government division) employed nearly four-fifths of these workers. Nearly all of the others worked for the Federal Government in the continental United States. A small number worked for the Federal Government overseas.

Government employees represent a significant portion of each State's work force. They work in large cities, small towns, and even in remote and isolated places such as lighthouses and forest ranger stations.

Continuing the trend begun in the late 1940's, employment in State and local government is expected to grow faster than the average for all industries through the mid-1980's. Federal employment, on the other hand, is expected to grow much more slowly than the average for all industries. Many job opportunities also will arise at all levels of government as workers retire, die, or leave the government service.



Government Activities and Occupations

Two-fifths of all government workers in 1973, or 5.9 million, provided educational services, mostly at the State and local levels in elementary and secondary schools. Besides teachers, others who worked in educational services included administrative and clerical workers, maintenance workers, librarians, dietitians, nurses, and counselors.

About 1.1 million civilian employees in 1973 worked for Federal agencies which are concerned with national defense and international relations. Occupations in this group include administrative and clerical workers, physicians, nurses, teachers, engineers, scientists, technicians, and craft and other manual workers. They work in offices, research laboratories, navy yards, arsenals, and missile launching sites and in hospitals and schools run by the military services.

Another 1.4 million workers provided health services and staffed hospitals, primarily for State and local governments. Many workers also were employed in housing and community development, police and fire protection, social security and public welfare services, transportation and public utilities, financial administration, general administrative functions, and judicial and legislative activities. The majority of these workers also were State and local government employees. All of the 700,000 government workers in postal services and a majority of the 400,000 workers in natural resource fields, such as the National Park and Forest Service, were employed by the Federal Government.

Although the many government activities require a diversified work force having various levels of education, training, and skill, 2 out of 3 government employees are white-collar workers. Among the largest white-collar occupational groups are teachers, administrators, postal clerks, and office workers such as stenographers, typists, and clerks.

Some important service, craft, and manual occupations are aircraft and automotive mechanics, repairers, police, firefighters,

Table 1. Percent distribution of employment in government and private industry by occupation, 1974

Occupation	Government [1]	Private industry
Total	100	100
White-collar workers	67	45
Professional and technical	36	10
Managers and administrators	8	11
Clerical	23	16
Sales	[2]	7
Blue-collar workers	14	29
Craft and related workers	6	15
Transport equipment operatives	3	4
Other equipment operatives	1	15
Nonfarm laborers	4	5
Service workers	19	10
Farm workers	[2]	4

[1] Excludes Federal employment overseas.
[2] Less than 0.5 percent.
NOTE: Because of rounding, sums of individual items may not equal totals.
SOURCE: Bureau of Labor Statistics

truckdrivers, skilled maintenance workers (for example, carpenters, painters, plumbers, and electricians) custodial workers, and laborers.

Because of the special character of many government activities, the occupational distribution of employment is very different from that in private industry, as shown in table 1.

The following chapters discuss opportunities for civilian employment in the major divisions of government and in the various branches of the Armed Forces. A separate chapter gives information on post office occupations.

FEDERAL CIVILIAN GOVERNMENT

Nature and Location of Employment

The Federal Government is the Nation's largest employer; it employed about 2,725,000 civilian workers in all parts of the United States in 1974. In addition, it employed about 60,000 U.S. citizens abroad. Although the headquarters of most Government departments and agencies are in the Washington, D.C. metropolitan area, only 1 out of 9 (about 340,000) Federal employees worked in that area in 1974. Nearly 300,000 worked in California, and more than 100,000 each in New York, Pennsylvania, Texas, and Illinois.

Federal employees work in occupations that represent nearly every kind of job in private employment, as well as some others unique to the Federal Government, such as postal clerk, regulatory inspector, foreign service officer, and Internal Revenue agent. Most Federal employees work for the departments and agencies that make up the executive branch of the government. Some are employed in the legislative and judicial branches.

The executive branch includes the Executive Office of the President, the 11 cabinet departments, and about 80 independent agencies, commissions, and boards. This branch is responsible for activities such as administering Federal laws, handling international relations, conserving natural resources, treating and rehabilitating disabled veterans, delivering the mail, conducting scientific research, maintaining the flow of supplies to the Armed Forces, and administering other programs to promote the health and welfare of the people of the United States.

The Department of Defense, which includes the Departments of the Army, Navy, and Air Force, is the largest agency. It employed over 1 million civilian workers in the United States in 1974. The departments of Agriculture; Health, Education, and Welfare; and Treasury each employed more than 100,000 workers. The two largest independent agencies were the U.S. Postal Service, which employed almost 700,000 workers, and the Veterans Administration, which employed over 200,000.

About 38,000 people worked for the legislative branch of government, which includes the Congress, the Government Printing Office, the General Accounting Office, and the Library of Congress. Almost 10,000 people worked for the judicial branch, which includes the Supreme Court and the other U.S. courts.

White-Collar Occupations. Because of its wide range of responsibilities, the Federal Government employs white-collar workers in a great many occupational fields. Nearly 2 million white-collar workers, including postal workers, worked for the Federal Government in 1974. About 150,000 of these work in engineering and related fields. Included in this total are about 85,000 engineers, representing virtually every branch and specialty of the profession. There also are large numbers of technicians in areas such as engineering, electronics, surveying, and drafting. Nearly two-thirds of all engineers are in the Department of Defense.

Of the 115,000 workers employed in accounting and budgeting work, 34,000 are professional accountants and Internal Revenue agents. Among administrative and managerial occupations in this field are tax technician and budget administrator. There also are large numbers of clerks in specialized accounting work. Accounting workers are employed throughout the Government, particularly in the Department of Defense, the Treasury Department, and the General Accounting Office.

More than 100,000 Federal employees work in hospitals or in medical, dental, and public health activities. Professional occupations in this field include physician, nurse, dietitian, medical technologist, and physical therapist. Among technician and aide jobs are medical technician, medical laboratory aide, and nursing assistant. Employees in this field work primarily in the Veterans Administration; others are in the Defense Department and the Department of Health, Education, and Welfare.

Almost 45,000 biological and agricultural science workers are employed by the Federal Government. Many of these work in forestry and soil conservation activities. Others administer farm assistance programs. The largest number were employed as biology, forest and range fire control , soil conservation , and forestry technicians. Most of these workers are employed by the Departments of Agriculture and Interior.

In the physical sciences, the Federal Government employs professional workers such as physicists, chemists, meteorologists, cartographers, and geologists. Aides and technicians in this field include physical science technician, meteorological technician, and cartographer's technician. Four-fifths of the 42,000 workers in the physical sciences are employed by the Department of Defense; the National Aeronautics and Space Ad-

ministration; and the Departments of Agriculture, Commerce, and Health, Education, and Welfare.

Within the mathematics field are professional mathematicians and statisticians, and mathematics technicians and statistical clerks. There also are a number of administrative positions in the related field of computer programming. Mathematics workers are employed primarily by the Defense Department, the National Aeronautics and Space Administration, and the Departments of Agriculture, Commerce, and Health, Education, and Welfare. Computer related occupations are found in most Federal agencies.

In the field of law there are more than 11,000 employees in professional positions, such as attorney, and others in administrative positions such as claims examiner. There also are many clerical positions that involve claims examining work. Workers in the legal field are employed throughout the Federal Government.

In the social science field there are professional positions for economists throughout the government; psychologists and social workers work primarily for the Veterans Administration; and foreign affairs and international relations specialists for the Department of State. Among social science administrative workers are social insurance administrators in the Department of Health, Education, and Welfare and intelligence specialists for the Department of Defense.

The Federal Government employs about 45,000 persons in investigative and inspection work. Large numbers of these workers are engaged in administrative activities, such as criminal investigation and health and regulatory inspection. Most of these jobs are in the Departments of Defense, Treasury, Justice, and Agriculture.

About 64,000 persons worked in jobs concerned with the purchase, cataloging, storage, and distribution of supplies for the Federal Government. This field includes many managerial and administrative positions such as supply management officer, purchasing officer, and inventory management specialist, as well as large numbers of specialized clerical positions. Most of these jobs are in the Department of Defense.

Nearly 460,000 general clerical workers are employed in all departments and agencies of the Federal Government. Included in this group are office machine operators, secretaries, stenographers, clerk-typists, mail and file clerks, telephone operators, and other related workers. In addition, there are several hundred thousand postal clerks employed by the Federal Government.

Entrance requirements for white-collar jobs vary widely. Entrants into professional occupations must have highly specialized knowledge in a specified field. Occupations typical of this group are attorney, physicist, and engineer.

Entrants into administrative and managerial occupations usually are not required to have knowledge of a specialized field, but rather must indicate that they have potential for future development by having a degree from a 4-year college or by responsible job experience. Entrants usually begin at a trainee level and learn the duties of the job after they are hired. Typical jobs in this group are budget analyst, claims examiner, purchasing officer, administrative assistant, and personnel officer.

Technician, clerical, and aide-assistant jobs have entry level positions that usually are filled by people who have a high school education or the equivalent. For many of these positions, no previous experience or training is required. The entry level position is usually that of trainee. Persons who have junior college or technical school training, or those who have specialized skills, may enter these occupations at higher levels. Jobs typical of this group are engineering technician, supply clerk, clerk-typist, and nursing assistant.

Blue-Collar Occupations. Blue-collar jobs—service, craft, and manual labor—provided employment for more than 544,000 workers in 1974. Most of these workers are in establishments such as naval shipyards, arsenals, air or army depots. Blue-collar workers also work on construction, harbor, flood-control, irrigation, or reclamation projects. The Department of Defense employs about three-fourths of these workers. Others work for the Veterans Administration, U.S. Postal Service, General Services Administration, Department of the Interior, Tennessee Valley Authority, and Department of Agriculture.

The largest single group of blue-collar workers consists of mobile equipment operators and mechanics. These jobs include those of forklift operator, chauffeur, truckdriver, and automobile mechanic. The next largest group of workers are general laborers, who perform a wide variety of manual jobs.

The Federal Government employs many workers in machinery operation and repair occupations, such as boiler and steam plant operator, machinist, machinery repairer, maintenance electrician, electronics equipment repairer, and aircraft mechanic.

Skilled construction workers also are utilized widely throughout the Federal Government in such jobs as carpenter, painter, plumber, steamfitter and pipefitter, and sheetmetal worker. Other important blue-collar occupations include warehouse worker, food service worker, and printer.

Entrance requirements. Persons with previous training in a skilled trade may apply for a position with the Federal Government at the

journeyman level. Those with no previous training may apply for appointment to one of several apprenticeship programs. Applicants are given a written examination and are rated on their potential to learn a skilled trade. The apprenticeship program generally lasts for 4 years with the trainee receiving both classroom and on-the-job training. After completing this training, a person is eligible for a position at the journeyman level. There also are a number of positions which require little or no prior training or experience. These include custodians, maintenance workers, messengers, and many others. (Detailed descriptions of the work duties, qualifications, and training of most white-collar, service, craft, and manual labor jobs mentioned above are provided in other sections of the *Handbook*.)

The Merit System

About 9 out of 10 jobs in the Federal Government in the United States are under the merit system. The Civil Service Act, administered by the U.S. Civil Service Commission, covers 61 percent of all Federal jobs. This act was passed by the Congress to insure that Federal employees are hired on the basis of individual merit and fitness. It provides for competitive examinations and the selection of new employees from among those who make the highest scores. The commission, through its network of 65 Civil Service Commission Area Offices, examines and rates applicants and supplies Federal departments and agencies with names of persons eligible for the jobs to be filled.

Some Federal jobs are exempt from Civil Service requirements, either by law or by action of the Civil Service Commission. However, most of these positions are covered by separate merit systems of other agencies such as the Foreign Service of the Department of State, the Department of Medicine and Surgery of the Veterans Administration, the Federal Bureau of Investigation, the Energy Research and Development Administration, the Nuclear Regulatory Commission, and the Tennessee Valley Authority.

Civil service competitive examinations may be taken by any U.S. citizen. To be eligible for appointment, an applicant must meet minimum age, training, and experience requirements for the particular job. A physical handicap will not in itself bar a person from a position if it does not interfere with his or her performance of the required duties. Examinations vary according to the types of positions for which they are held. Some examinations test the applicant's ability to do the job applied for or his or her ability to learn how to do it. Applicants for jobs that do not require a written test are rated on the basis of the experience and training described in their applications and any supporting evidence required.

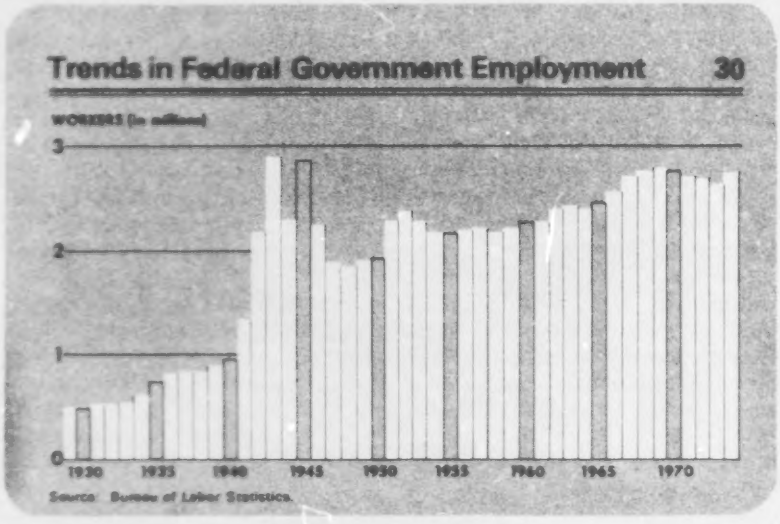
Applicants are notified as to whether they have achieved eligible or ineligible ratings, and the names of eligible applicants are entered on a list in the order of their test scores. When a Federal agency requests names of eligible applicants for a job vacancy, the area office sends the agency the names at the top of the appropriate list; the agency can select any one of the top three. Names of those not selected are restored to the list for consideration for other job openings.

Appointments to civil service jobs are made without regard to an applicant's race, color, religion, national origin, politics, or sex.

Employment Trends and Outlook

Federal employment is expected to grow more slowly than the average for all industries through the mid-1980's, continuing a trend begun in the late 1960's. Although total Federal Government employment is expected to rise somewhat, some Federal agencies will reduce their staffs as some administrative responsibilities will continue to be transferred to State and local governments. In addition, the Department of Defense is expected to reduce the number of its civilian employees.

In addition to some new jobs there will be openings due to the need to replace employees who



transfer out of the Federal service, retire, or die. Thus, many job opportunities will occur in occupations where total employment is relatively stable, as well as in those in which it is rising.

The proportion of Federal workers employed in professional, technical, and administrative jobs has gradually increased in recent years. On the other hand, the proportion employed in clerical and blue-collar jobs has fallen. These trends are expected to continue, reflecting the increasing demand for services of a growing population and the requirements of the country's international programs. These demands are expected to result in rising requirements for professional, administrative, and technical workers. Employment in many clerical and blue-collar occupations, however, will be limited by the Federal Government's increasing use of labor saving electronic data processing and materials handling equipment and the introduction of improved data transmission and communications systems.

Table 1. Distribution of full-time Federal employees under the General Schedule by grade level, March 31, 1974, and salary scale, effective October 13, 1974

General Schedule (GS) Grade	Employees		Salaries		
	Number	Percent	Entrance	Periodic increase	Maximum
Total all grades	1,322,313	100.0			
1	4,317	0.3	$5,294	$176	$6,878
2	36,240	2.7	5,996	200	7,796
3	109,584	8.3	6,764	225	8,789
4	167,377	12.7	7,596	253	9,873
5	176,960	13.4	8,500	283	11,047
6	81,401	6.2	9,473	316	12,317
7	121,387	9.2	10,520	351	13,679
8	26,206	2.0	11,640	388	15,132
9	129,846	9.8	12,841	428	16,693
10	21,837	1.7	14,117	471	18,356
11	141,718	10.7	15,481	516	20,125
12	128,602	9.7	18,463	615	23,998
13	101,496	7.7	21,816	727	28,359
14	46,744	3.5	25,581	853	33,258
15	23,801	1.8	29,818	994	[2] 38,764
16	3,428	.3	34,607	1,154	[2] 43,839
17	1,003	.1	[2] 40,062	1,335	[2] 45,402
18	366	(1)	[2] 46,336	.....	.....

[1] Less than 0.05 percent.

[2] Basic pay limited by section 5308 of title 5 of the United States Code to $36,000 as of the above date.

SOURCE: U.S. Civil Service Commission; preliminary data.

Earnings, Advancement, and Working Conditions

Nearly all Federal civilian employees are paid according to one of three major pay systems; the General Pay Schedule, the wage system, and the Postal Field System. (The Postal Field System is discussed with Post Office Occupations elsewhere in the *Handbook*.)

Nearly half of all Federal Workers are paid under the General Schedule. The General Schedule is a pay scale for workers in professional, administrative, technical, and clerical jobs, and for workers such as guards and messengers. General Schedule jobs are classified by the U.S. Civil Service Commission in one of 18 grades, according to the difficulty of duties and responsibilities, and the knowledge, experience, and skills required of the worker. General Schedule (GS) pay rates are set by Congress and apply nationwide. They are reviewed annually to insure that they remain comparable with salaries in private industry.

The distribution of Federal white-collar employees by General Schedule grade, the entrance and maximum salaries for each grade, and the amount of each grade's periodic increases are listed in table 1. Appointments usually are made at the minimum rate of the salary range for the appropriate grade. However, appointments in hard-to-fill positions may be at a higher rate.

Employees in all grades except the highest, GS-18, receive within-grade pay increases after they have worked the required time period, if their work is at an acceptable level of competence. Within-grade increases may be given also in recognition of high-quality service.

High school graduates who have no related work experience usually start in GS-2 jobs, but some who have special skills begin at grade GS-3. Graduates of 2-year junior colleges and technical schools often can begin at the GS-4 level. Most people appointed to professional and administrative jobs such as psychologist, statistician, economist, writer and editor, budget analyst, accountant, and physicist, can enter at grades GS-5 or GS-7, depending on their academic record. Those who have a master's degree, or the equivalent education or experience, usually enter at the GS-9 or GS-11 level. Advancement to higher grades generally depends upon ability, work performance, and openings in jobs with higher grades.

About one-quarter of the Federal civilian workers are paid according to the coordinated Federal Wage System. Under this system, craft, service, and manual workers are

Table 2. Coordinated Federal Wage System hourly rates [1] for selected occupations and location, January 1, 1975

Location	Labor (heavy)	Electrician	Tool, die, and gauge maker
Atlanta	$3.96	$6.21	$7.17
Boston	4.45	5.98	6.55
Chicago	4.84	6.65	7.43
Denver	3.52	5.83	6.40
Norfolk–Portsmouth–Newport News–Hampton	3.80	5.37	6.04
Houston, Galveston–Texas City	4.09	5.87	6.64
Los Angeles	4.73	6.50	7.25
New Orleans	3.68	5.44	6.19
New York	4.56	6.03	6.67
Pensacola	3.98	6.20	7.17
Philadelphia	4.99	6.05	6.51
Seattle–Everett–Tacoma	5.18	6.49	7.06
San Francisco	5.15	6.97	7.75
St. Louis	4.38	5.84	6.49
Washington, D.C.	4.39	6.24	7.03

[1] Rates are for nonsupervisory workers for the 3rd step of a 5-step pay range.

SOURCE: Bureau of Labor Statistics

paid hourly rates which are established on the basis of "prevailing" rates paid by private employers for similar work in the same locations. As a result, the Federal Government wage rate paid for an occupation varies by locality, as illustrated in table 2.

Federal Government employees work a standard 40-hour week. Employees who are required to work overtime receive premium rates for the additional time or compensatory time off at a later date. Most employees work 8 hours a day and 5 days a week, Monday through Friday, but in some cases, the nature of the work requires a different workweek. Annual earnings for most full-time Federal workers are not affected by seasonal factors.

Federal employees earn 13 days of annual (vacation) leave each year during their first 3 years of service; 20 days each year until the end of 15 years; after 15 years, 26 days each year. Nine paid holidays are observed annually. Workers who are members of military reserve organizations also are granted up to 15 days of paid military leave a year for training purposes. A Federal worker who is laid off is entitled to unemployment compensation similar to that provided for employees in private industry.

Other benefits available to most Federal employees include: a contributory retirement system, optional participation in low-cost group life and health insurance programs which are partly supported by the Government, and training programs to develop maximum job proficiency and help workers achieve their highest potential. These training programs may be conducted in Government facilities or in private educational facilities at Government expense.

Sources of Additional Information

Information on employment opportunities in the Federal Government is available from a number of sources. High school students are often able to get information from their high school guidance counselors. A college placement office is often a good source of such information for college students. Information also may be available from State employment service offices and many U.S. post offices.

Sixty-five area offices operated by the U.S. Civil Service Commission are located in various large cities throughout the country. These offices announce and conduct examinations required for various Federal Government jobs. They evaluate qualifications and refer eligible applicants to employing agencies for their geographic areas. They also provide a complete one-stop information service on local and nationwide job opportunities in the Federal Government service. The area offices also operate a toll-free telephone information service in nearly all States for those unable to visit them. Their telephone numbers are listed in most telephone books under "U.S. Government."

For information about jobs in a specific agency, contact the agency directly.

OCCUPATIONS IN THE POSTAL SERVICE

The U.S. Postal Service handled about 90 billion pieces of mail in 1974, including letters, magazines, and parcels. About 700,000 workers were required to process and deliver this mail. The vast majority of Postal Service jobs are open to workers with 4 years of high school or less. The work is steady, and the pay can range beyond $12,000 a year. Some of the jobs, such as mail carrier, offer a good deal of personal freedom. Other jobs, however, are more closely supervised and more routine.

Nature and Location of the Industry

Most people are familiar with the duties of the mail carrier and the post office window clerk. Yet few are aware of the many different tasks required in processing mail and of the variety of occupations in the Postal Service.

At all hours of the day and night, a steady stream of letters, packages, magazines, and papers moves

through the typical large post office. Mail carriers have collected some of this mail from neighborhood mailboxes; some has been trucked in from surrounding towns or from the airport. When a truck arrives at the post office, mail handlers unload the mail. Postal clerks then sort it according to destination. After being sorted, outgoing mail is loaded into trucks for delivery to the airport or nearby towns. Local mail is left for carriers to deliver the next morning.

To keep buildings and equipment clean and in good working order, the Postal Service employs a variety of service and maintenance workers. Included are janitors, laborers, truck mechanics, electricians, carpenters, and painters. Some workers specialize in repairing machines that process mail.

Postal inspectors audit post offices operations to see that they are run efficiently, that funds are spent properly, and that postal laws and regulations are observed. They also prevent and detect crimes such as theft, forgery, and fraud involving use of the mail.

Postmasters and supervisors are responsible for the day-to-day operation of the post office, for hiring and promoting employees, and for setting up work schedules.

The Postal Service also contracts with private businesses to transport mail. In 1974, there were about 12,500 of these "Star" route contracts. Most " Star" route carriers use trucks to haul mail, but in some remote areas horses or boats are used instead.

Almost 85 percent of all postal workers are in jobs directly related to processing and delivering mail. (See table 1.) This group includes postal clerks, mail carriers, mail handlers, and truckdrivers. (Detailed information on Mail Carriers and Postal Clerks is given elsewhere in the *Handbook*.) Postmasters and supervisors make up nearly 10 percent of total employment, and maintenance workers about 4 percent. The remainder includes such workers as postal inspectors, guards, personnel workers, and secretaries.

The Postal Service operates more than 41,000 installations. Most are post offices, but some serve special purposes, such as handling payroll records or supplying equipment.

Although every community receives mail service, employment is concentrated in large metropolitan areas. Post offices in cities such as New York, Chicago, and Los Angeles employ a great number of workers because they not only process huge amounts of mail for their own populations but also serve as mail processing points for the smaller communities that surround them.

Training, Other Qualifications, and Advancement

An applicant for a Postal Service job must pass an examination and meet minimum age requirements. Generally, the minimum age is 18, but a high school graduate may begin work at 16 if the job is not hazardous and does not require use of a motor vehicle. Many Postal Service jobs do not require formal education or special training. Applicants for these jobs are hired on the basis of their examination scores.

Applicants should apply at the post office where they wish to work and take the entrance examination for the job they want. Examinations for most jobs include a written test. A physical examination is required, as well. Applicants for jobs that require strength and stamina are sometimes given a special test. For example, mail handlers must be able to lift mail sacks weighing up to 70 pounds. The names of applicants who pass the examinations are placed on a list in the order of their scores. Separate eligibility lists are maintained for each post office. Five extra points are added to the score of an honorably discharged veteran, and 10 extra points to the score of a veteran wounded in combat or disabled. Disabled veterans who have a compensable, service-connected disability of 10 percent or more are placed at the top of the eligibility list. When a job opens, the appointing officer chooses one of the top three applicants. Others are left on the list so that they can be considered for future openings.

New employees are trained either on the job by supervisors and other experienced employees or in local training centers. Training ranges from a few days to several months, depending on the job. For example, mail handlers and mechanics' helpers can learn their jobs in a relatively short time. Postal inspectors, on the other hand, need months of training.

Postal workers are classified as casual, part-time flexible, part-time regular, or full-time. Casual workers are hired to help handle the large amounts of mail during the Christmas season and for other short-term assignments. Part-time flexible employees do not have a regular work schedule but replace absent workers or help with extra work loads as the need arises. Part-time regulars have a set work schedule—for example, 4 hours a day. Carriers, clerks, and mail handlers may start as part-time flexible workers and move into full-time jobs according to their seniority as vacancies occur.

Advancement opportunities are available for most postal workers because there is a management commitment to provide career development. Also, employees can get preferred assignments, such as the day shift or a more desirable delivery route, as their seniority increases. When an opening occurs, employees may submit written requests, called "bids," for assignment to the vacancy. The bidder who meets the qualifications and has the most seniority gets the job.

In addition, postal workers can advance to better paying positions

by learning new skills. Training programs are available for low-skilled workers who wish to become technicians or mechanics.

Applicants for supervisory jobs must pass an examination. Additional requirements for promotion may include training or education, a satisfactory work record, and appropriate personal characteristics such as leadership ability. If the leading candidates are equally qualified, length of service also is considered.

Although opportunities for promotion to supervisory positions in smaller post offices are limited, workers may apply for vacancies in a larger post office and thus increase their chances.

Employment Outlook

Employment in the Postal Service is expected to grow more slowly than the average for all industries through the mid-1980's. Mechanization of mail processing and more efficient delivery should allow the Postal Service to handle increasing amounts of mail without corresponding increases in employment. Nevertheless, thousands of job openings will result as workers retire, die, or transfer to other fields.

Earnings and Working Conditions

Postal Service employees are paid under several separate pay schedules depending upon the duties of the job and the knowledge, experience, or skill required. For example, there are separate schedules for production workers, such as clerks and mail handlers; for rural carriers; for postal managers; and for postal executives. In all pay schedules, except that of executives, employees receive periodic "step" increases up to a specified maximum if their job performance is satisfactory. A distribution of employees in levels 1 through 8, with entrance and maximum salaries, is shown in table 1.

Table 1. Employment and salaries in the Postal Service

Grade level	Employment [1]	Salary schedules [2]	
		Entrance	Maximum
Total	449,679		
1	555	$8,692	$10,595
2	2,946	9,111	11,168
3	8,257	9,564	11,786
4	39,920	10,054	12,452
5	352,613	10,586	13,171
6	42,880	11,157	13,962
7	2,132	11,776	14,801
8	376	12,445	15,425

[1] On June 30, 1974; includes nonsupervisory employees in post offices who are paid annual salaries. Does not include rural carriers or part time and casual employees.
[2] In effect in mid-1974; does not include rural carriers.

Most mail handlers are at level 4 and most postal clerks and mail carriers are at level 5.

Full-time employees work an 8-hour day 5 days a week. Both full-time and part-time employees who work more than 8 hours a day or 40 hours a week receive overtime pay of one and one-half times their hourly rates.

In 1974, postal employees earned 13 days of annual leave (vacation) during each of their first 3 years of service, including prior Federal civilian and military service; 20 days each year for 3 to 15 years of service; and 26 days after 15 years. In addition, they earned 13 days of paid sick leave a year regardless of length of service.

Other benefits include retirement and survivorship annuities, free group life insurance, and optional participation in health insurance programs supported in part by the Postal Service.

Most post office buildings are clean and well lighted, but some of the older ones are not. The Postal Service is in the process of replacing and remodeling its outmoded buildings, and conditions are expected to improve.

Most postal workers are members of unions and are covered by a national agreement between the Postal Service and the unions.

Sources of Additional Information

Local post offices and State employment service offices can supply details about entrance examinations and employment opportunities in the Postal Service.

STATE AND LOCAL GOVERNMENTS

State and local governments provide a very large and expanding source of job opportunities in a wide variety of occupational fields. In 1974, over 11.8 million people worked for State and local government agencies; nearly three-fourths of these worked in units of local government, such as counties, municipalities, towns, and school districts.

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Educational services account for the majority of jobs in State and local government. About 5.9 million employees worked in public schools, colleges, or other educational services.

In addition to the nearly 3 million classroom and college teachers, school systems, colleges, and universities also employed administrative personnel, librarians, guidance counselors, nurses, dietitians, clerks, and maintenance workers. Three-fourths of these worked elementary and secondary schools, which are administered largely by local governments. State employment in education is concentrated chiefly at the college, university, and technical school levels.

The next two largest fields of State and local government employment were health services and highway work. The almost 1.4 million workers employed in health and hospital work included physicians, nurses, medical laboratory technicians, and hospital attendants. More than 600,000 people worked in highway activities such as construction and maintenance. Highway workers include civil engineers, surveyors, operators of construction machinery and equipment, truckdrivers, concrete finishers, carpenters, and construction laborers.

General governmental control and financial activities accounted for about 840,000 workers. These included chief executives and their staffs, legislative representatives, and persons employed in the administration of justice, tax enforcement and other financial work, and general administration. These functions require the services of individuals such as lawyers, judges, and other court officials, city managers, property assessors, budget analysts, stenographers, and clerks.

Police and fire protection is another large field of employment. Over 600,000 persons were engaged in police work, including administrative, clerical, and custodial personnel, as well as uniformed and plainclothes police. Local governments employed all of the 300,000 firefighters, many of whom work only part time.

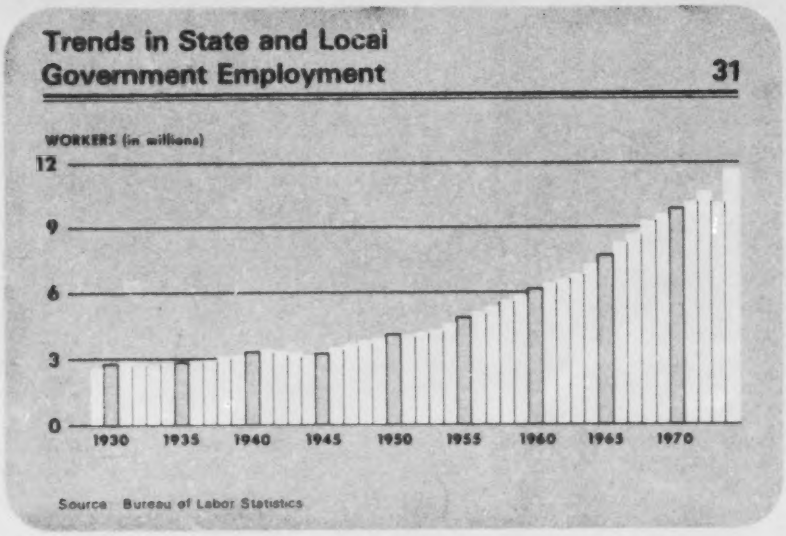
Other State and local government employees work in a wide variety of activities; local utilities (such as water or electricity), transportation, natural resources, public welfare, parks and recreation, sanitation, correction, local libraries, sewage disposal, and housing and urban renewal. These activities require workers in diverse occupations such as economist, electrical engineer, electrician, pipefitter, clerk, forester, and busdriver.

Clerical, administrative, maintenance, and custodial work make up a large portion of employment in most government agencies. Among the workers involved in these activities are clerk-typists, stenographers, secretaries, office managers, fiscal and budget administrators, bookkeepers, accountants, carpenters, painters, plumbers, guards, and janitors. (Detailed discussions of most occupations in State and local governments are given elsewhere in the *Handbook*, in the sections covering the individual occupations.)

Employment Trends and Outlook

The long-range trend in State and local government employment has been steadily upward. (See accompanying chart.) Much of this growth results from the need to provide additional services as population increases and as people move from rural to urban areas. City development has required additional street and highway facilities; police and fire protection; and public health, sanitation, welfare, and other services. Population growth and increasing personal income have generated demand for additional and improved education, housing, health facilities, and other services. Except for elementary and secondary school teachers, State and local government employment is expected to grow faster than the average for all industries through the mid-1980's.

A large State and local work force also will be needed to provide improved public transportation systems, more urban planning and renewal programs, increased police protection, better measures to guard against air and water pollution, and expanded natural resource development programs. In



addition, large numbers of workers will be needed to replace employees who transfer to other fields of work, retire, or die.

Federal-State programs in education, vocational training, medicine, and other fields will increase the needs of local and State governments for professional, administrative, and technical personnel. These will include engineers, scientists, social workers, counselors, teachers, physicians and librarians.

Most positions in State and local governments are filled by residents of the State or locality. Often, however, it is necessary to recruit from outside if shortages of particular skills exist.

Earnings and Working Conditions

Earnings of State and local government employees vary widely, depending upon occupation and locality. Salaries from State to State tend to reflect differences in the general wage level in various localities.

The *Handbook* statement for individual occupations often gives salary information for State and local government employment. Salary information also can be obtained from the appropriate State and local government agencies.

A majority of State and local government positions are filled through some type of formal civil service test, that is, personnel are hired and promoted on the basis of merit. In some areas, groups of employees, such as teachers and police, have separate civil service coverage for their specific groups.

Most State and local government employees are covered by retirement systems or by the Federal Social Security program. They usually work a standard week of 40 hours or less, with overtime pay or compensatory time benefits for additional hours of work.

Sources of Additional Information

Persons interested in working for State or local govenment agencies should contact the appropriate State, county, or city agencies. Offices of local school boards, city clerks, school and college counselors or placement personnel, and local offices of State employment services have additional information.

THE ARMED FORCES

The Armed Forces offer young men and women career opportunities in a range of occupations almost as wide as that found in civilian life. Jobs include clerical and administrative work, skilled construction trades, electrical and electronic occupations, auto repair, and hundreds of other specialties requiring varied amounts of education and training. Each year the Armed Forces give hundreds of thousands of men and women basic and advanced training which can be useful in both military and civilian careers.

Since the Selective Service draft authority was allowed to lapse in 1973, the various branches of the Armed Forces—Army, Air Force, Navy, Marine Corps, and Coast Guard—are being staffed entirely through voluntary enlistments. The military services must compete with civilian employers and offer occupational benefits and training programs which make military service an attractive career alternative. These benefits are explained in more detail later in this statement.

A young person may enlist in any one of a variety of programs that involve different combinations of active and reserve duty. Active duty ranges from 2 to 6 years, with 3- and 4-year enlistments the most common. In general, enlistments for over 4 years are for job specialties which require a considerable amount of advanced technical training.

At the end of 1974, over 2.2 million men and women were on active duty in the Armed Forces: about 780,000 in the Army; 645,000 in the Air Force; 545,000 in the Navy; 190,000 in the Marine Corps; and 36,000 in the Coast Guard. Of these about 50,000 were women. In addition to those on active duty, over 175,000 persons were in active reserve units.

Military personnel are stationed throughout the United States and in many countries around the world. In the United States, the largest numbers are in California, followed by Texas, North Carolina, Florida, Georgia and the Washington, D.C. metropolitan area. Over 500,000 are outside the United States. The majority of these—over 300,000—are stationed in Europe (particularly Germany); large numbers also are in the Western Pacific. In addition, over 200,000 Navy, Marine Corps, and Coast Guard personnel are assigned to ships, installations, and ports in the United States and its outlying areas, and around the world.

Job Training and Education for Enlisted Personnel

The Armed Forces train personnel in hundreds of different types of jobs. Job training available to enlistees depends on the length of their service commitment, their general and technical aptitude, the needs of the service, and personal preferences. Following a basic training period of between 6 and 11 weeks, depending on service branch, a majority of recruits go directly to formal classroom training in a specialty while the remainder receive on-the-job training at their first duty assignment. For those not assigned directly to schools, there is opportunity for formal classroom training following on-the-job training.

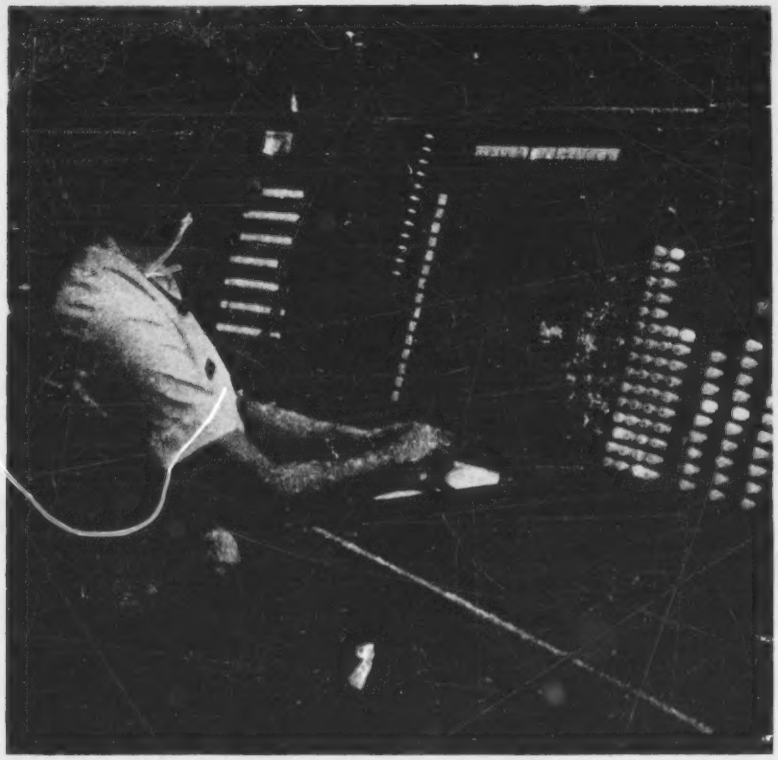
Following initial or advanced training, an individual is sent to his or her service assignment. The type and location of duty depend on service vacancies, personal qualifications, and personal preferences.

Persons planning to apply the skills gained through military training to a civilian career should obtain certain information before choosing a military occupation. First, they should determine how good the prospects are for civilian employment in jobs related to a particular military specialty. Second, they should know what the prerequisites are for the related civilian job. Many occupations require licensing, certification, or a minimum level of education. Those interested should find out whether military training is sufficient to enter the field or, if not, what additional training will be required.

Much information on the employment outlook for civilian jobs for which military training helps prepare an individual is given in other *Handbook* statements. Additional information often can be obtained from schools, unions, trade associations and other organizations in the field of interest, or from a school counselor. By looking into this kind of information before choosing a specific military occupation, young people entering the Armed Forces will help insure that the type of training they obtain will fit their career plans.

A list of major job categories for enlisted personnel is presented below.

Administrative Specialists and Clerks
- Personnel
- Administration
- Clerical personnel
- Accounting, finance, and disbursing
- Supply and logistics
- Religious, morale, and welfare
- Information and education
- Communications center operations



Electrical and Mechanical Equipment Repairers
- Aircraft
- Automotive
- Wire communications
- Missiles, mechanical and electrical
- Armament and munitions
- Shipboard propulsion
- Power generating equipment
- Precision equipment
- Aircraft launch equipment
- Other mechanical and electrical equipment

Crafts
- Metalworking
- Construction
- Utilities
- Construction equipment operation
- Lithography
- Industrial gas and fuel production
- Fabric, leather and rubber
- Firefighting and damage control
- Other crafts

Service and Supply Handlers
- Food service
- Motor transport
- Material receipt, storage, and issue
- Military Police
- Personal service
- Auxiliary labor
- Forward area equipment support

Infantry, Gun Crews, and Seamanship Specialists
- Infantry
- Armor and amphibious
- Combat engineering
- Artillery/gunnery, rockets, and missiles
- Combat air crew
- Seamanship

Electronic Equipment Repairers
- Radio/radar
- Fire control systems
- Missile guidance and control
- Sonar equipment
- Nuclear weapons equipment
- ADP computers
- Teletype and cryptographic equipment
- Other electronic equipment

Communications and Intelligence Specialists
- Radio and radio code
- Sonar
- Radar and air traffic control
- Signal intelligence/electronic warfare
- Military intelligence
- Combat operations control

Medical and Dental Specialists
- Medical care
- Technical medical services
- Related medical services
- Dental Care

Other Technical and Allied Specialists
- Photography
- Drafting, surveying, and mapping
- Weather
- Ordnance disposal and diving
- Scientific and engineering aides
- Musicians

A brief description of each category as it relates to civilian jobs follows:

Administrative specialist and clerk jobs are found in most private businesses and government agencies and require the same basic skills as those learned in the military services.

Electrical and mechanical equipment repairers generally are instructed in the basic theories and advanced troubleshooting techniques involved in the operation and repair of equipment. This instruction and training make transfer to a similar civilian job fairly easy in many career fields. In others, some additional civilian training may be needed.

In general, the various *skilled crafts or trades* require some kind of apprenticeship program. In some cases credit is given towards the apprenticeship requirement for skills acquired through military training and experience.

Many of the *service and supply occupations* are identical to those in civilian life. Such military experience is helpful in obtaining similar civilian employment.

On the other hand, many of the jobs in the *infantry, gun crews and seamanship specialist* group are unique to the Armed Forces, having few or no parallels in civilian jobs. However, this work experience may be helpful in developing leadership and supervisory skills which provide a good base for future civilian employment.

Those working as *electronic equipment repairers* generally maintain and repair specialized military equipment. However, most of the training and experience gained can be directly related to civilian occupations such as electronics technician, aircraft instrument mechanic, or radar and radio repairer. The service-trained specialist in this area may need additional training on specialized equipment before gaining journeyman status in civilian employment. Credit is sometimes given in an apprenticeship program for skills acquired in the service. Also, in certain occupations, such as electrician, for example, applicants may be required to show an adequate level of knowledge by passing an examination before a license to practice is issued.

Some of the *communications and intelligence specialist* occupations have civilian counterparts, such as sonar, radar, and radio operators. In general, however, these have a limited civilian demand. Other jobs, such as military intelligence or combat operations control have very few or no parallel civilian occupations.

In recent years, changes in military training and civilian requirements in the *medical and dental* fields have greatly increased civilian employment opportunities for service-trained personnel. An examination is required in most fields to show proficiency. Some of

the civilian occupations in which service-trained men and women can become certified include: physician's assistant; laboratory technician; emergency medical care technician; medical technologist; dental assistant; nurse (most States allow service trained personnel to take the Licensed Practical Nurse Examination; a few, the registered Nurse Examination); and physical therapists.

Other technical and allied specialists include a wide range of jobs, many having direct civilian parallels such as photographer, meteorologist, musician, and others providing skills with limited demand in the civilian sector such as ordnance disposal and diving.

Traditionally, women in the armed services have been limited to jobs in the administrative, clerical, or medical fields. Today, women are eligible and encouraged to enter all military occupational fields except those involving actual combat.

Other Educational Programs

In addition to on-duty training, a variety of programs are available to help military personnel continue their education. A Tuition Assistance program is available at most military installations for active duty personnel who wish to take off-duty courses leading to a bachelor's or advanced degrees. Assistance also is available for schooling ranging from basic subjects through college and technical occupational courses.

Each service branch offers programs for full-time education, providing full pay, allowances, tuition, and related fees. Other programs enable the enlisted man or woman to take college courses and additional military training leading to commissioning as an officer. Courses also are available to help service personnel earn their high school equivalency diploma. In addition, programs are being instituted to permit the application of credit for military training courses towards associate or baccalaureate college degrees from participating institutions.

Officer Training

Officer candidates in the Armed Forces receive training through a wide variety of programs: The Federal Service Academies (Naval, Air Force, Military, and Coast Guard); Reserve Officer Training Corps (ROTC); Officer Candidate School; National Guard (State Officer Candidate School programs); and direct appointment.

The Federal Service Academies provide a 4-year college program leading to a bachelor of science degree. The midshipman or cadet is provided free room and board, tuition, medical care, and a monthly allowance. Graduates may receive regular commissions in all branches of the service and have a 5-year active duty obligation.

To become a candidate for appointment as a midshipman or cadet in the Naval, Air Force, or Military Academy, most applicants obtain a nomination from an authorized nominating source (usually a member of Congress). It is not necessary to know a member of Congress personally to request a nomination. The nominee must

meet certain requirements, which include an academic record of a specified quality, college aptitude test scores above an established minimum, recommendations from teachers or school officials, and passing a medical examination. Appointments are made from eligible nominees according to personal preference of the nominating authority and by a competitive system based on the nominees' qualifications. The dependents of certain veterans may gain admission. Active and reserve service members also may gain admission through applications.

Appointments to the Coast Guard Academy are made on a competitive basis. A nomination is not required.

The Reserve Officer Training Corps (ROTC) Program involves the training of students in over 500 Army, Navy, Marine Corps, and Air Force units at participating colleges and universities throughout the United States. As a part of the school curriculum, ROTC training includes 2 to 5 hours of military instruction a week in addition to regular college courses. Some summer training also is required. Advanced ROTC training, occurring during the junior and senior years, is optional (except under the Navy programs) and students must qualify for admission.

Advanced ROTC students are paid a monthly allowance while attending school and receive additional pay for summer training. Scholarships also are available on a competitive basis. Following graduation, ROTC students fulfill their military obligations by serving as regular or reserve officers for a stipulated period of time.

A commission in the Armed Forces can be earned without ROTC training by those who enlist from civilian life into one of the several Officer Candidate School Programs. The Army, Navy, Air Force, Marine Corps and Coast Guard train selected college graduates to become commissioned officers. The National Guard also has several Officer Candidate Programs for qualified high school graduates.

Many men and women who are trained in medicine or one of the related health sciences may qualify for direct appointment as officers. Financial assistance is available to students enrolled in training in one of these fields. Direct appointments also are available for those qualified to serve in other occupations, such as judge advocate general or chaplain.

The Armed Forces offer a wide variety of flight training programs, many of which lead to a commission. In addition, all services have programs for qualified enlisted personnel to obtain commissions.

Salary, Allowances, Promotion, and Working Conditions

In addition to regular salary, military personnel receive free room and board, medical and dental care, a military clothing allowance, military supermarket and department store shopping privileges, recreational facilities, 30 days of paid vacation a year, and travel opportunity. When room and board are not provided, a living allowance is given. Table 1 gives examples of military pay and allowances.

Active career officers and enlisted personnel also are eligible for retirement benefits after 20 years of service.

The pay grades for enlisted personnel begin at E-1, the lowest, and go to E-9, the highest. The lowest pay grade for commissioned officers is 0-1; the highest, 0-10.

Enlisted personnel will normally be promoted to pay grade E-3 within their first 12 months of service. Further promotions depend on individual merit, but in-grade pay increases are possible on the

Table 1. Active duty military compensation in 1974 for members of the Armed Forces who are single and have less than 2 years of service

Pay grade	Regular military compensation, total	Basic pay	Quarters allowance	Subsistence allowance
Enlisted members:				
E-1	$5,756	$4,129	$759	$868
E-2	6,278	4,600	810	868
E-3	6,562	4,780	914	868
E-4	6,872	4,971	1,033	868
Commissioned officers:				
O-1	9,594	7,610	1,378	606
O-2	11,128	8,766	1,756	606
O-3	12,669	10,058	2,005	606

SOURCE: Department of Defense.

basis of length of service.

The normal workweek in the Armed Forces is 8 hours a day, 5 or 5 1/2 days a week. Due to the nature of military work, an individual or group may be called upon to work longer hours without additional compensation. With the wide range of jobs found in the service, working conditions vary substantially. Some jobs which are extraordinarily dangerous, or in an undesirable location, provide additional income in the form of a bonus or special payments.

Athletic and other recreational facilities, such as libraries, gymnasiums, tennis courts, golf courses, and movies, are available on most military installations. Service personnel also may get help with personal or financial problems from personal affairs officers, legal assistance officers, and chaplains, and from other supporting agencies.

Veterans' Benefits

The Veterans Administration provides numerous benefits to those who have served in the Armed Forces. The educational assistance program is usually the most important to those considering enlisting.

Veterans who have at least 181 days of continuous active duty are eligible for educational benefits. Each eligible person is entitled to 1 1/2 months of educational assistance for each month of service on active duty, up to a maximum of 36 months. These benefits may be received for education at any approved institution, including public or private elementary, secondary, vocational, correspondence, business, or flight training schools; junior or teachers' colleges; normal schools; colleges or universities; professional, scientific, or technical institutions; and various other institutions that furnish education at the elementary level or above. A member of the service who has not received a secondary school diploma (or an equivalency certificate), and needs to take a remedial or refresher course to prepare for enrollment in an education or training program, may receive such training without having it charged against the benefits earned through military service.

In addition to training in an educational institution, GI Bill benefits are available for apprenticeship or on-the-job training and flight training. The amount of the training assistance allowance depends on the type of program and the number of dependents of the veteran. For full-time education in an approved institution, a veteran with no dependents received $270 a month in January 1975; with one dependent, $321; with two dependents, $366; and $22 for each additional dependent. A veteran with no dependents receiving apprenticeship or on-the-job training was paid $196 for each of the first 6 months; $147 for each of the second 6 months; $98 for each of the third 6 months; and $49 for each additional month; with one dependent, $220, $171, $122, $73; with two dependents, $240, $191, $142, $93; and $10 a month for each additional dependent. Another attractive veterans' benefit available is a guaranteed home, farm, or business loan.

Each of the Armed Forces Reserve Programs offers pay, promotion, training, education and retirement benefits similar to those of the active duty programs.

More detailed or current information on educational benefits, as well as other veterans benefits, is available from the Veterans Administration office located in each State, the District of Columbia, Puerto Rico, and the Philippines.

Other Sources of Information

Each of the military services publishes handbooks and pamphlets that describe entrance requirements, training and advancement opportunities, and other aspects of military careers. These publications are available at all recruiting stations, most State employment service offices, high schools, colleges and public libraries. Individuals may obtain additional information by writing to the addresses below:

U.S. Army Recruiting Command, Fort Sheridan, Ill. 60037.

Navy Recruiting Command (Code 40), 4015 Wilson Blvd., Arlington, Va. 22203.

USAF Recruiting Service, Directorate of Recruiting Operations, Randolph Air Force Base, Tex. 78149.

Commandant of the Marine Corps, Code MMRE-7, Headquarters Marine Corps, Washington, D.C. 20380.

Commandant (G-PMR), U.S. Coast Guard, Washington, D.C. 20590.

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